EDITORIAL

UNLESS the progress of international conferences should disrupt present plans, I expect to be in Geneva for the next few months as a member of the Australian delegation to the International Telecommunications Conference, whose deliberations are scheduled to commence on August 14.

I will be there as an observer/adviser on the frequency allocations for the amateur service, as it is officially described and known, and the Wireless Institute of Australia whose representative I will be has sponsored the trip.

They have done this because of their concern about the ability of the amateurs to withstand the great pressures which the advances of communication have imposed on the distribution of available frequencies.

In addition, they are anxious that someone associated with amateur radio, as I have been for many years, should gain experience of such a conference, to help them not only in considering their own position, but in understanding more fully the problems of the administration which must put into practice the decisions made at Geneva.

The enormous complexity of the task set such conferences can only be realised by looking through the list of services all seeking the best possible conditions for the next 11 years, which is the normal span between them.

It becomes apparent then how completely our civilisation is dependent upon radio waves for its existence, and how basic the requirement for speedy and versatile communication to keep pace with our needs.

Today the word communication is literally outdated. We are using more and more radio waves for control and automatic systems, we use them to track satellites and detect stars which emit no light and are therefore invisible to the eye.

Even the needs of projected space travel must now be included, and the proposals which will be considered suggest a series of channels to be used in organising our existence there.

It is obvious that if we are not to run completely out of available space we must continue our efforts to develop equipment for use in the largely unexplored regions where megacycles are measured in thousands, and to refine that now used in present bands so that more services can be fitted into the same space.

That is a fundamental challenge to our ingenuity, which has already produced amazing feats of engineering skill.

At Geneva there will be a gathering of experienced and distinguished men from most countries of the world, and I hope to hear many interesting things there and in other countries I shall visit.

John Moyle

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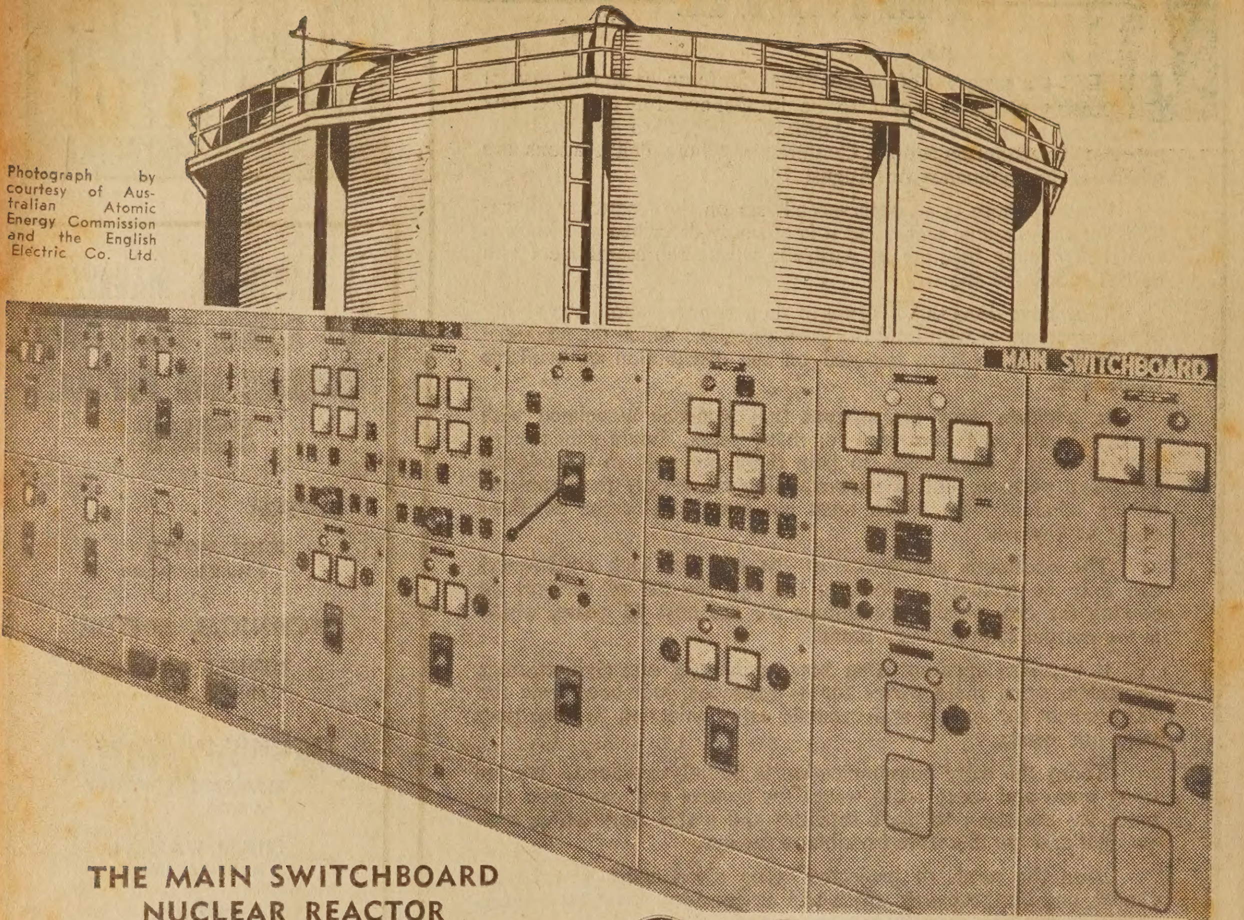
OUR COVER PICTURE

ARMY'S RADAR EYES—A modern radar unit as used by the Australian Army is able to follow small objects to great heights. This one recently tracked a model aircraft up to a height of 14,250 feet.



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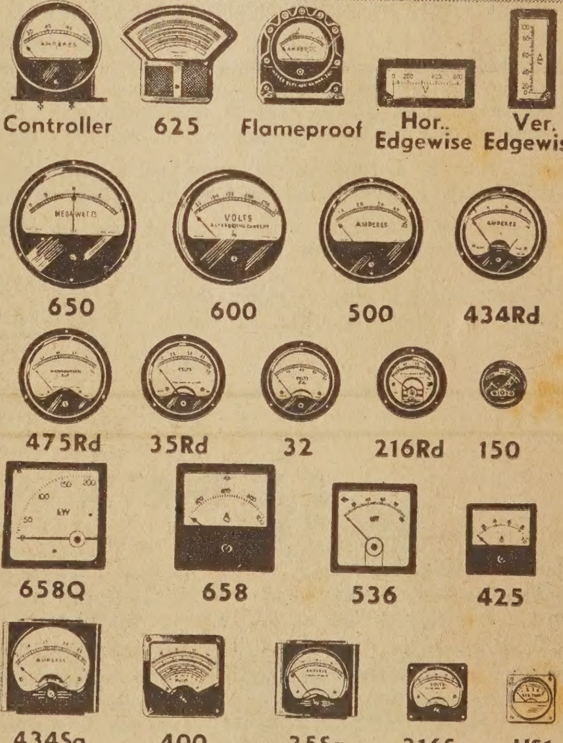

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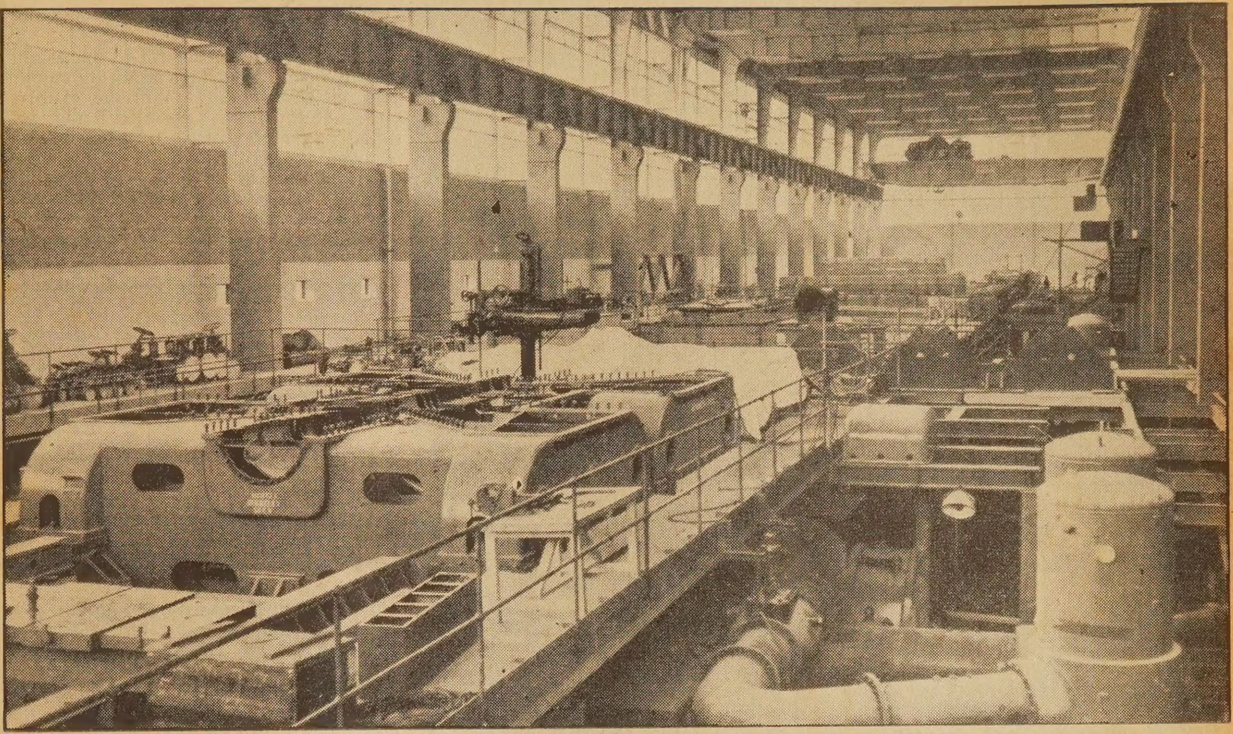
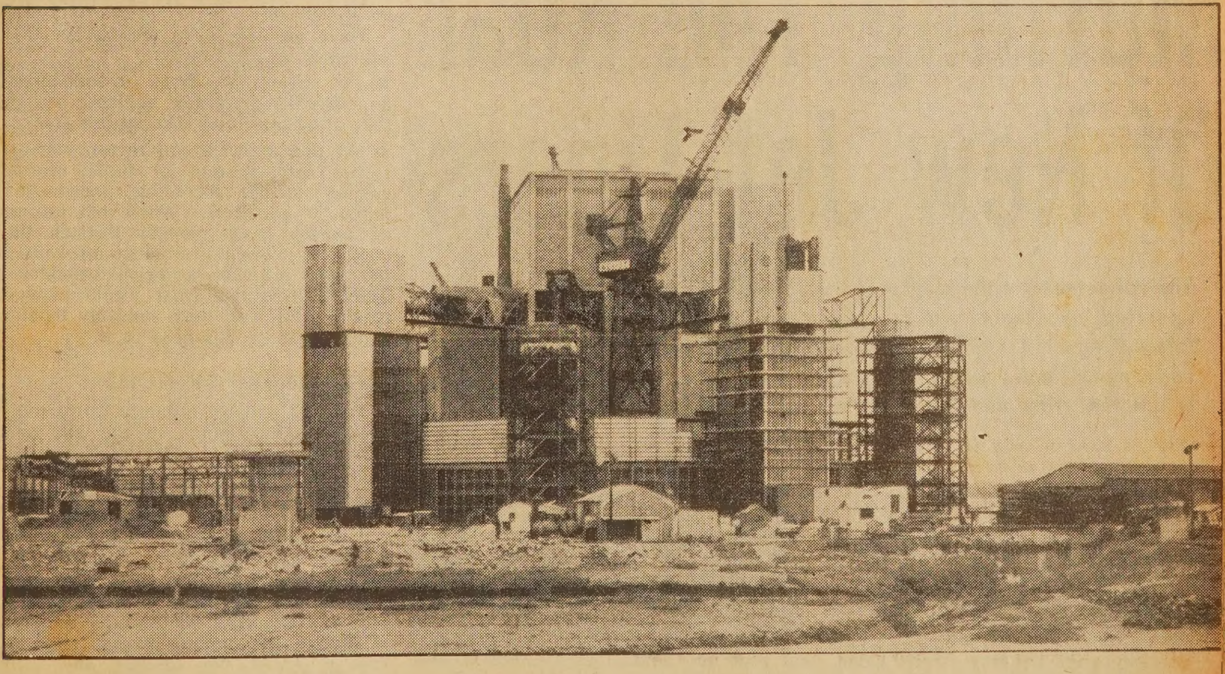


The turbine hall at Berkeley power station in Gloucestershire, showing installation of the first 83 megawatt alternator set to be commissioned late in 1960.



Five nuclear power stations have been constructed up to this date throughout the world, all constructed primarily for military reasons. But the British Central Electricity Generating Board plans, by 1967, to produce 6,000 megawatts for the national grid, or 25 per cent of the present total available power. The Berkeley station illustrated is one of several to be completed next year and which will contribute 300 megawatts.

This remarkable picture shows the cloud of smoke from the Boeing 707 as it left Kingsford Smith Airport on its first Australian take-off. The photographer's position has accentuated its density.

Muffling The Roar Of New Jet Liners

The appearance of the smaller of the Boeing 707 jet airliners in Australia, operated by Qantas overseas services, has created enormous public interest, and not a little apprehension because of the amount of noise and engine fumes which are present particularly on take-off. In this article the writer analyses the problem of noise and the steps taken to reduce it.

By Wesley S. Griswold

SKY travel is about to enter a wonderful new era. In recent months both Britain and America have sent the first commercial jet airliners whisking across the world on passenger flights.

Soon a long line of similar planes—twice as heavy and roomy and fast as any we've known before—will start leapng continents and hopping oceans, laden with important travellers.

The passengers on that historic first light leaned back in the bright comfort of a broad, lofty, 100ft cabin, steady and nearly as quiet as a living-room. As they looked down upon the remote sea and cloud floes, their plane seemed to hang in space while the earth turned slowly over, 35,000 feet beneath it.

When they glanced along the leading edges of the wings, they saw, in place of the familiar round blurs of whirling propellers, only the fixed, open mouths to four turbojets. Instead of the insistent roar and contagious tremble of big reciprocating engines, they heard only a sound like that of a distant waterfall, and felt no vibration.

But while the passengers enjoy this exhilarating sensation of effortless soaring, airline operators are worrying about certain matters which never bothered them before.

That unprecedented hush in the cabin, for example. How far can an off-colour joke be heard in it? Will the exuberant party in the cosy forward lounge set off a sputter of protests from passengers aft who are trying to sleep? Cross-aisle conversation will be easy — and easily audible to others. Will chatterboxes have to be shut up?

These are relatively trivial anxieties of the jet age. There's a problem that gives airline operators far more concern —one which, if unsolved, could stall jet travel before it ever got started. It's this:

How are the folks on the ground going to react to these big birds—as conspicuous on an airfield apron among the smaller DC-7s and Super Connies as seagulls in a flock of pigeons? Their size will be alluring, but what about the noise they make as they fly in and out of the nation's principal airports? For it is a painful paradox that, though a large jet plane is exceptionally quiet inside during flight, it can be unusually noisy outside when it is pushing itself off the ground.

There are two main reasons for that whopping external racket:

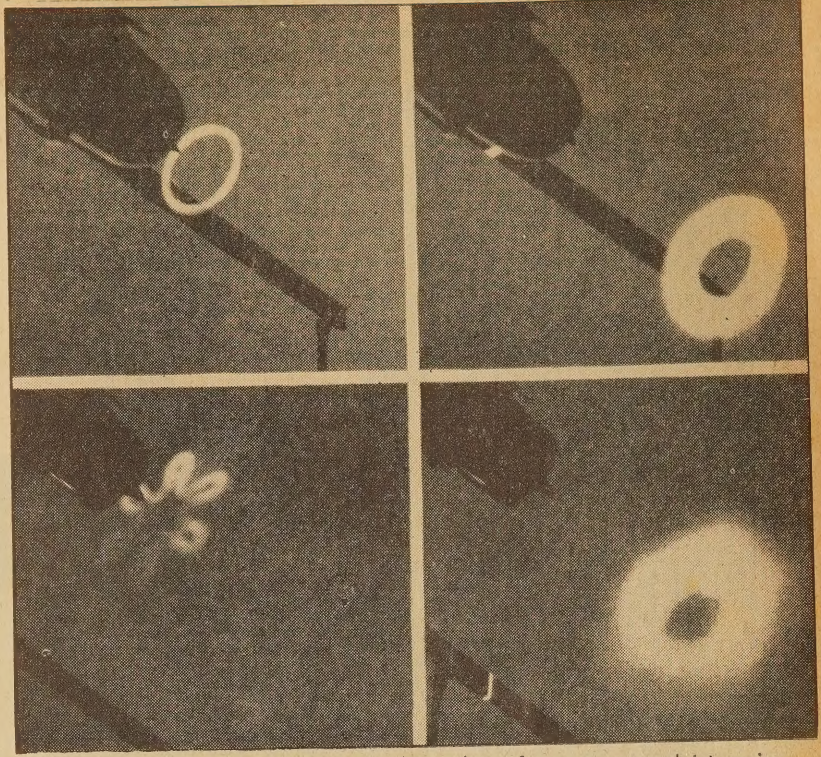
- Jet engines are three or four times as powerful as piston engines, though they are lighter and take up less space.
- At maximum takeoff thrust, exhaust rushes out of one of those mighty engines at an incredible speed—765 m.p.h. at sea level. When that torrent of searing gases ploughs through the cool, lazily drifting ambient air behind the plane, it creates a mighty turbulence. The effect is like what would happen in a pond if you were suddenly to aim a high-pressure fire hose at it.

MECHANISM OF NOISE

The jet's exhaust instantly forms multitudes of whirlpools in the air, and those baby cyclones, whamming into one another, cause a thundering turmoil. Not only is this torturous to listen to at close range but its reverberations pummel the chests of more distant bystanders and roll on to shake windows and rattle dishes in adjacent houses.

Airlines were warned long ago by the Port of New York Authority, proprietor of one of the nation's busiest airports, that it would not tolerate any such hurly-burly around Idlewild, which is boxed in by residential areas. Since trans-continental and trans-Atlantic U.S. airlines had to have access to this field, they passed the buck to the plane builders.

SMOKE RINGS DOUBLE FOR SOUND



NOISE IN MOTION: Two top pictures show exhaust from unsuppressed jet engine. Bottom pair shows jet equipped with sound suppressor that diffuses jet stream to mix faster with surrounding air, reducing bellow. Photos were taken for Douglas engineers by saturating the atmosphere around the exhaust with oily vapour, and passing a powerful beam of light through it.

Boeing and Douglas, who are making the largest jetliners, set out to find a way to muffle the engines' thunder and limit the travel of sound. The problem was given to teams of acoustical, aerodynamic, and power-plant experts to solve. Though their approaches vary in detail, essentially the teams came up with the same answer: Give the jets higher voices. Instead of letting them bellow, like their military brothers, make them hiss.

This hiss, you should understand, is far from being as gentle as its name implies. It is like a battery of sandblasters at work. But it is a barrage of sounds of higher frequencies than if no one had tried to shush them. And it is a happy acoustical fact that high-frequency sounds don't carry as far as low-frequency sounds do. They "attenuate faster," as the acoustical engineers say. Furthermore, high-frequency sounds don't set up sympathetic vibrations in structures. They hit and bounce off.

FREQUENCY RAISED

To turn a jet's bellow into a hiss, the experts put a kind of spray nozzle on the high-speed flow of its exhaust.

This sounds simple. But you can't do that sort of thing to a jet engine without interfering with its thrust. Moreover, when you add width or length to an engine nacelle, you increase a plane's drag.

Lowering thrust and raising drag immediately play hob with flight requirements vital to an airline: range, payload, speed. For example, to the front office a 1 per cent loss in range means that 670 pounds of weight—in passengers, fuel or freight—must be left behind, or flights must be shortened.

Caught in this excruciating squeeze between the need to quiet their jet airliners and the need to make them pay, the buyers could only demand that the plane manufacturers find some way to assure them of both goals.

Boeing's hardware for the job is now appearing on its hefty, handsome 707 jet transport. The sound-suppressor is a bundle of short, fat, slightly tapered tubes. It is fastened over each engine's single exhaust port, two feet in diameter. In place of that one original exit for combustion gases, the Boeing suppressor provides 21. There is a central tube 10 inches in diameter. Around it is a circle of 10 tubes, each four inches across. And around that is another circle of 10 tubes, each six and a quarter inches across.

VOLUME REDUCED

As the engine exhaust belches through these 21 tubes, narrower and longer than its original exit, it creates far smaller whirlpools in the surrounding air than it did originally. The resulting noise is of much higher frequency than that of an unsuppressed jet engine. There is less of it, too.

Astonishingly, sound-level tests have shown that the Boeing 707 makes slightly less noise than the biggest piston-engine planes we are used to.

Will it sound quieter to you? Maybe not, because it is a distinctly different sound. People who are accustomed to listening to military jets will be impressed by how much quieter the sound-suppressed passenger jets are. But those who normally hear only the drone of reciprocating engines in the sky will instantly know that a new note has been added to the sounds overhead.

Three years of exacting and often frustrating experiment led to Boeing's final sound-suppressor design. More than 550 models, in an incredible variety of patterns, were made and tested. One even had 523 exhaust ports. It quenched sound enormously, but it also reduced thrust by an appalling amount.

QUIET, PLEASE! — Boeing has hushed noise remarkably in the 707 cabin by placing preformed glass fibre batts and rubber isolator mounts between the plane's outer skin and inner panels.

What damage, if any, did sound-suppression ultimately do to the 707's flight performance? Boeing guaranteed the airlines that the penalty for muzzling the sound enough to satisfy the Port of New York Authority would be limited to a 4 per cent loss in range, with 2 per cent loss in thrust at take-off. Boeing says it has done better than that, but the amount is an airline secret.

Loss of thrust at take-off is a big penalty, because the faster a plane can climb from the runway, the quicker it gets above the noise-annoyance level for nearby residential areas.

Douglas is hard at work, too. Their sound engineers have been trying as long and as hard as Boeing's men to smother the noise of jet engines without serious loss of thrust. But they have one important advantage over their rivals — more time to devote to the problem. Douglas' first DC-8 to take paying passengers aloft won't be flying for another year.

DOUGLAS RESEARCH

There had to be an interim sound suppressor available for test flights of the DC-8, however. That model, a splayed cluster of seven pear-shaped tubes around a circular central tube, is at work in the air almost every day. Each of the outer tubes contains a toothy duct, leading into it from an outside opening. As exhaust spurts from these tubes, it draws in surrounding air through the ducts and mixes with it.

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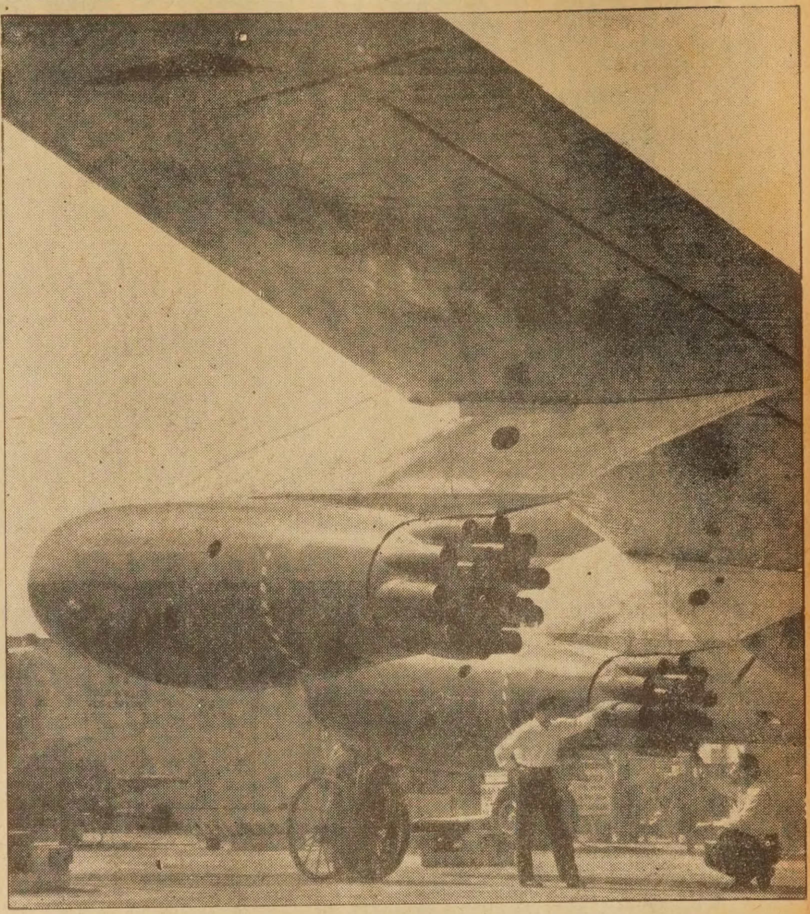
SUPPRESSORS REDUCE JET NOISE



The latest version of sound suppressors has been fitted to the engines of the Boeing 707, developed after early tests had shown the noise to be offensive.

Douglas engineers say this device suppresses jet sound about as well as the Boeing 21-tube nozzle.

But the Douglas acoustics experts have gone on beyond this temporary solution to one they feel is even more promising.

Their sound suppressor for the first DC-8s to go into commercial use looks rather like a metal daisy. It has eight petal-shaped openings that radiate from a circular centre, which rings the protruding cone at the rear of the jet engine. Exhaust gases pouring through this strange array of exits mix quicker with the surrounding air than ever before. This situation reduces sound levels below any previous figure.

As a final touch, Douglas has added what is called an ejector. This is an engine cowling that moves to the rear of the sound suppressor at take-off and forms a short tunnel for the exhaust to pass through as it leaves the suppressor. The strong suction created around the lip of the ejector pulls in ambient air around the lobes of the "daisy" and mixes it with the exhaust in the ejector, thus increasing the mass of air that rushes out the rear. This suppresses noise still further. What's more, the Douglas men proudly claim that the aerodynamic flow over the ejector cuts the previous thrust loss during take-off to zero.

QUIETEST UP FRONT

Passengers on the new jetliners will find that the seats up front are the quietest places to sit. This is just the opposite of what we are used to. But even the riders furthest back will be aware of unfamiliar quietness.

This is partly because the sound suppressors have changed the character of the turbulence behind the engines and have prevented it from colliding with the outer walls of the cabin. Partly it is because cabin insulation is concentrated toward the rear of both the 707 and DC-8.

Even so, it is a most curious fact that the insulation is needed not so much to shut out engine noise as to stifle an odd new sound produced by jet speed. This is called boundary-layer noise. It is comparable to the rush of foaming water past the hull of a racing yacht, and it is caused by the ultra-swift passage of the plane's body through the air. The 707, for instance, cruises up to 605 m.p.h.

The volume of boundary-layer noise is such that even if the plane's inboard engines were to be shut off during flight, no passenger would know the difference, engineers of both companies say.

But so well have the outside sounds been muffled that the engineers have even had to squelch the whistle of the two planes' air-conditioning systems, to prevent it from annoying the passengers.

FINAL PROBLEM

One jet sound still uncurbed—though both Boeing and Douglas are at work on the problem—is compressor whine, a high-pitched scream that rises when the engines gulp torrents of air through fixed vanes and whirling turbine blades in their throats. This goes on constantly while a jet engine is in use, but aloft the sound is of such high frequency as to be beyond all hearing. It is a problem only on the ground, when the engines are started and warmed up and the planes are taxi-ing.

Compressor whine attenuates fast and will never be a community nuisance. Windows and walls shield airport visitors and airline customers from most of it. To prevent passengers from wincing at the whines of neighbouring jets while they are walking toward their own, some airlines are planning to conduct them aboard through movable tunnels.

Solid-state work moving into Infrared

SOLID-STATE research is headed toward infrared-optical work in submillimetre wavelengths, according to Harvard professor Nicholas Bloembergen.

A solid-state infrared quantum counter under development at Harvard promises spectroscopy much higher resolution in millimetre range.

Maser-like device uses paramagnetic salts, is basically an energy converter, with a multiplier phototube as quantum counter and an arc or gaseous discharge for optical pumping.

The infrared quantum counter was proposed by Bloembergen before an American Physical Society meeting at MIT. The device is not yet in operation.

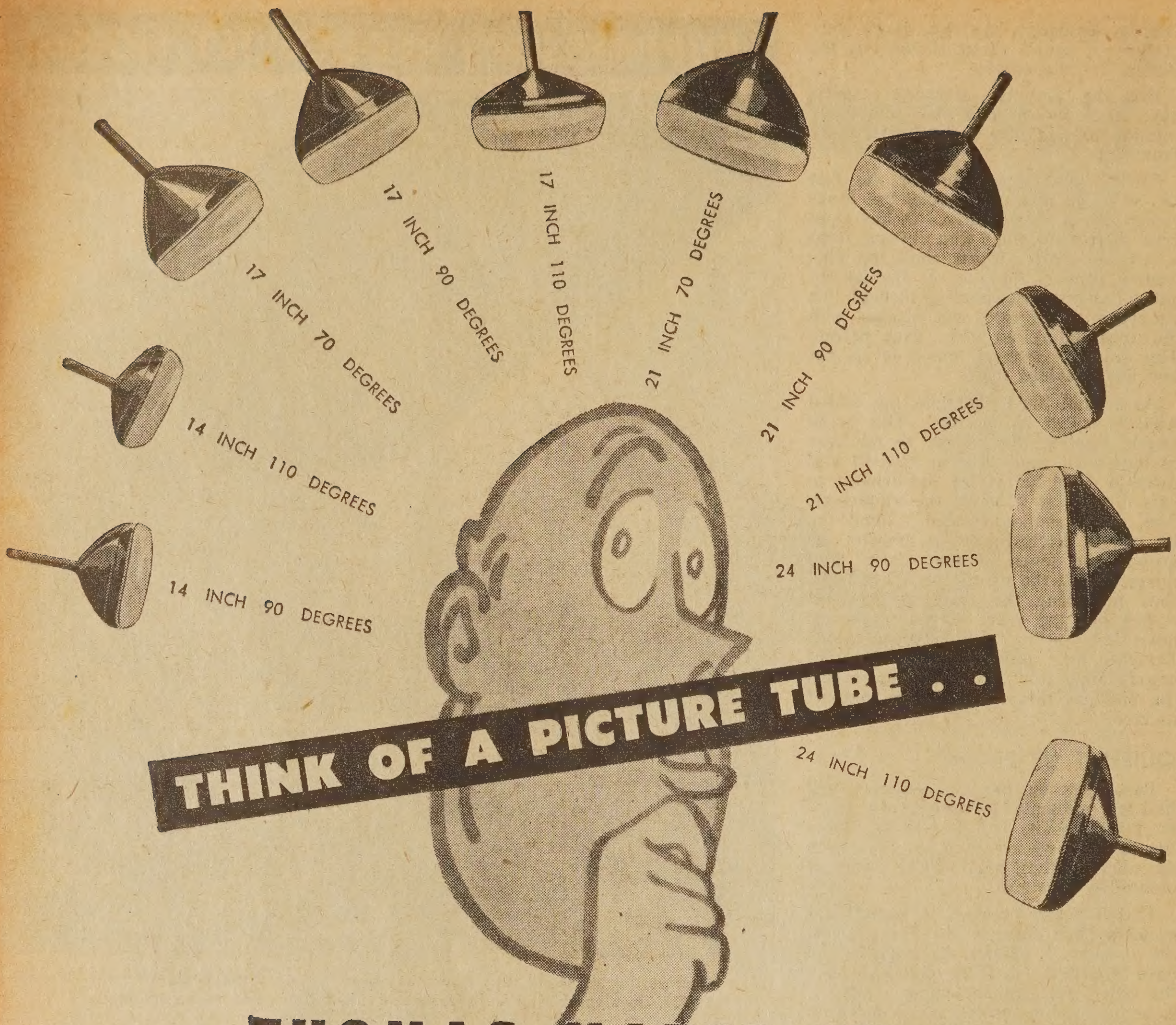
Bloembergen said a maser used as a coherent infrared generator with an infrared quantum counter as a detector would comprise a "very powerful combination." Masers in the infrared-optical range are under development by Columbia's C. H. Townes.

Also at APS meeting, Bernard Mathias, of Bell Labs, reported evidence that superconductivity and ferro-magnetism are positively related — not mutually exclusive.

Combining magnetic metals like chromium, manganese, iron with other metals can make alloys that become superconducting at relatively high cryogenic temperatures.

Mathias said discovery of ferromagnetic superconductors makes possible synthesis of new magnets, also metals which are superconducting and behave like strong magnets at same time.

Probably three years will be needed to evaluate impact of the discovery, the Bell Labs scientist said, but he said it may result in simplification of design and other improvements in superconductive memory devices such as the cryotron.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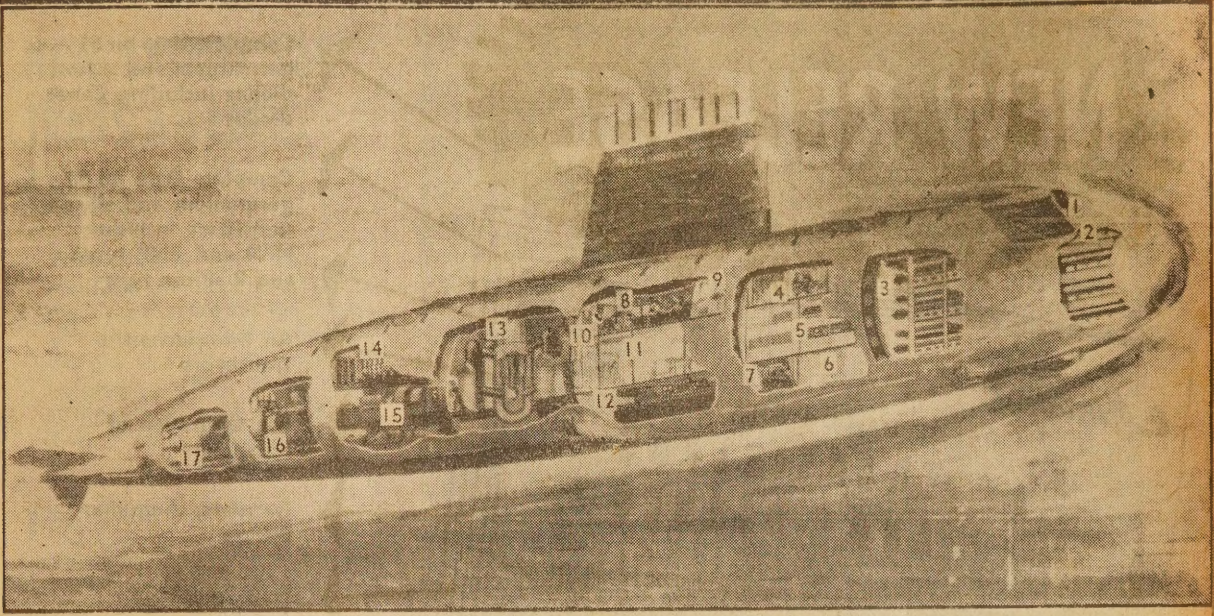
BRITAIN'S FIRST NUCLEAR SUB



Layout drawing of Britain's first nuclear powered submarine.

DREADNOUGHT IS LAUNCHED IN BRITAIN

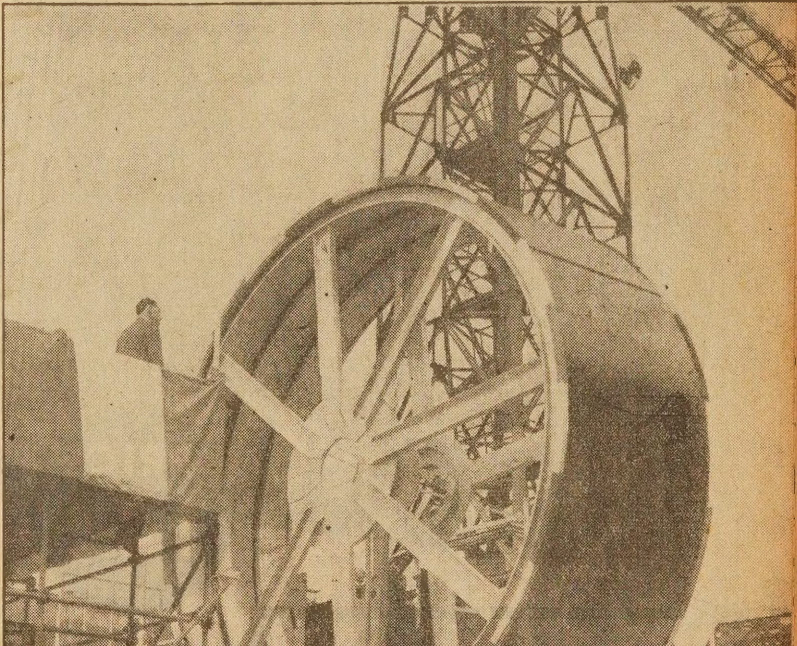
The first British nuclear-powered submarine has commenced construction, and the "keel" was officially laid by the Duke of Edinburgh on June 12 at the Barrow - in - Furness yards of Vickers Armstrong (Shipbuilders) Ltd.

THE keel bears no resemblance to the traditional backbone of the orthodox ship. It is, in fact, a prefabricated circular section of steel plating which will finally be located at the centre of the hull, and to which the fore and aft sections will be attached as building progresses.

The submarine will be fitted with a nuclear power plant similar in design to that now used in the latest American submarines of the "Skipjack" class.

Key to sectionalised drawing is:—

1. **Hydroplane.**
2. **Torpedo tubes.**
3. **Torpedo compartment.**
4. **Officer's accommodation.**
5. **Crew accommodation.**
6. **Stores compartments.**
7. **Pump compartment.**
8. **Control compartment.**
9. **Captain's accommodation.**
10. **Washplaces.**
11. **Galley.**
12. **Battery compartment.**
13. **Reactor.**
14. **Machinery control.**
15. **Main machinery.**
16. **Turbine gearing.**



The Duke of Edinburgh speaks at the laying of the keel.

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BBC TV ACROSS THE ATLANTIC

NEW SYSTEM USES TRANS-ATLANTIC CABLE

A few weeks ago, viewers in Australia saw some news films of the Canadian visit of the Queen which had been sent to England via the ordinary trans-Atlantic telephone cable. These were accompanied by a short B.B.C. feature which explained how it was all done.

THIS article and illustrations have been sent to us from the B.B.C., and represent the first technical description to be published of the equipment used for transmitting the pictures.

While these are crude as compared with the best in current use, they are quite good enough for use on such special occasions, and, no doubt, in time they will be better still.

The technique holds interesting possibilities for the linking of services over other paths not so difficult to handle.

Here is the B.B.C. report:

NEWS FILMS BY CABLE

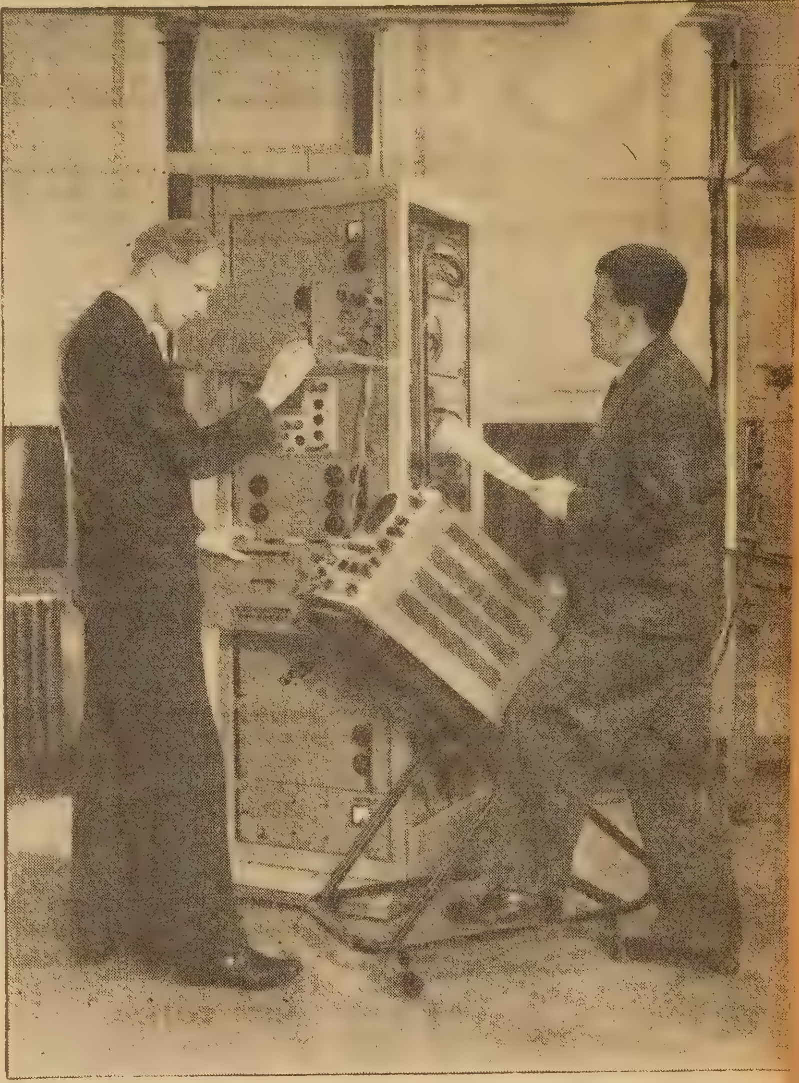
The B.B.C. Engineering Division has developed a system for transmitting brief television news picture sequences and other short television film sequences of up to one minute's duration over a circuit of the trans-Atlantic telephone cable normally used for sound. These picture transmissions can be sent over the cable in both directions.

With this system pictures of the Queen's departure on June 18, for the Royal visit to Canada, were brought into the homes of viewers in Canada and the U.S.A. almost as soon as they were seen by viewers in Britain. The new system was again used to transmit back a film showing the opening by the Queen of the St. Lawrence Seaway on June 26. Films of other important events were also transmitted by the new system, the development of which makes use of an altogether new technique. It follows an earlier pioneer effort made by B.B.C. Television News in 1957.

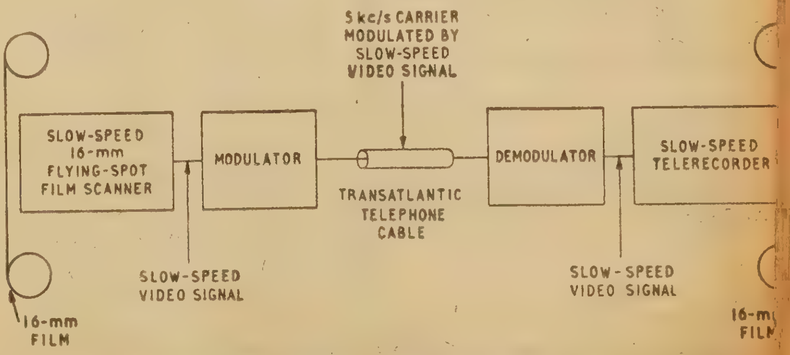
SPECIAL SCANNER

The process employs a slow-speed flying spot film scanner, the video signal from which is used to modulate a carrier for transmission over the cable. At the receiving end the signals are demodulated and used to operate a slow-speed film telerecording equipment. The arrangement is shown in the diagram on this page.

Consideration of the characteristics of the Atlantic cable indicated that a maximum video frequency of 4.5 kc/s could



Main equipment is housed in a console cabinet. Here two engineers of the B.B.C which designed and built the equipment make last performance checks before th unit is put into service. The first event given full cover by the new equipmen was the visit of Her Majesty the Queen to Canada and the United States. Sub sequently these pictures were seen in various parts of the world mostly as part o news services.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SLOW-SPEED VIDEO SIGNAL
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A block diagram of the equipment which illustrates the main units used in
It is really a high speed form of standard picture transmission having a much low
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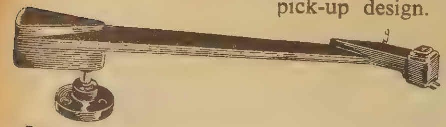

BLACK SHADOW is a new concept in crystal pick-up design. Supplied with Selector Box and Black Shadow L.P. cartridge with Diamond stylus. Complete.

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HGP40: A de-luxe crystal pick-up complete with separate standard and microgroove heads. (HGP-39 std. and HGP39 L.P. cartridge).

PRICE £9/15/0

GP32: Magnetic pick-up provides a good standard of reproduction with normal equipment at low price. Output voltage, ½ volt at 1,000 c.p.s.

PRICE £2/12/6

GP66: Series of lightweight pick-up with die cast arm construction increasing torsonial rigidity, minimising arm resonance.

Complete (with GP65-1 or GP65-3 cartridge) . . . .

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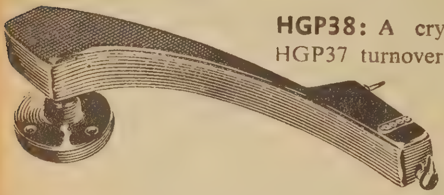

HGP38: A crystal pick-up. Incorporates the HGP37 turnover cartridge for standard or microgroove recordings with cantilever stylus.

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GP50: Is a HIGH-OUTPUT crystal pick-up suitable for reproducing standard and microgroove records through low-gain amplifiers as used in small record players (GP59-3 cartridge) **PRICE £4/19/6**

GP60: Incorporates the latest type CERAMIC cartridge—unaffected by heat or humidity For use in tropical areas (GP61-1C cartridge) **PRICE £6/16/**

GP10: Is a crystal pick-up utilising the GP9 cartridge, combining purity of reproduction with extreme reliability, resonance-free response from 50/8,000 c.p.s. Output. 1.5v at 1,000 c.p.s. (GP9 cartridge).

PRICE £3/12/6

plus these acos replacement cartridges

HGP39 CARTRIDGE

Low element mass and very high compliance enables the heaviest modulation possible to be traced with a minimum of record wear. Both standard and L.P. heads available.

PRICE £3/12/6

GP9 CARTRIDGE

Famous as the cartridge with the unbreakable crystal. Takes standard steel or fibre needles for 78 r.p.m. records.

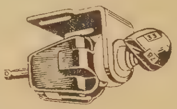
PRICE **£1/11/6**

GP59 CARTRIDGE

A High output turnover cartridge suitable for reproducing standard and microgroove records through low-gain amplifiers.

PRICE **£2/3/**

GP61 CARTRIDGE



A Ceramic turnover cartridge that will withstand the the rigours of a tropical climate and is, at the same time, very robust. **PRICE £3/19/6**

HGP37 CARTRIDGE

A Crystal turnover cartridge with cantilever stylus that utilises a new method of crystal drive, a bisectional control element that achieves independent characteristics for standard and microgroove.

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GP65

Turnover crystal cartridges available in two types, medium output High Quality or High output

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BLACK SHADOW CARTRIDGE

Fitted with diamond stylus to be used with Black Shadow arm and Selector **Price £14**

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be used. It has therefore been necessary to effect as many economies in the bandwidth of the video signal as are compatible with acceptable picture quality. These economies are:

(i) Restriction of the horizontal definition to that corresponding with a bandwidth of 1.75 Mc/s in the 405-line television system.

(ii) A reduction to 200 lines using sequential scanning.

(iii) The scanning at the transmitting end of only alternate film frames with each frame-scan reproduced on two adjacent film frames at the receiving terminal.

EXPANDED TIME

These measures result in reducing the 3 Mc/s bandwidth of the British television system to approximately 450 kc/s, the remainder of the bandwidth reduction being obtained by a decrease of the scanning speed until the maximum video frequency corresponds with the available 4.5 kc/s upper limit. The time required to scan the film is approximately 100 times normal and thus a half-minute news flash takes approximately 50 minutes to transmit.

Sixteen millimetre film has been chosen because it is almost universally used for television news. The average length of television newsreel sequences is less than half a minute and the new system will make it possible to transmit facsimiles of these sequences in much less time than it would take to fly them across the Atlantic. The speed of transmission of each film frame is about 75 times faster than previous methods of sending still pictures by facsimile transmission. It is interesting to note that for east to west transmissions it will be possible to broadcast an item at a time which is earlier by the clock than the time at which the actual event occurred.

SCANNER AND RECORDER UNIT

This equipment, part of that used to send TV signals across the Atlantic, operate as a flying-spot film scanner when transmitting and as a telerecorder when receiving The picture tube on the right is used for monitoring when transmitting and recording

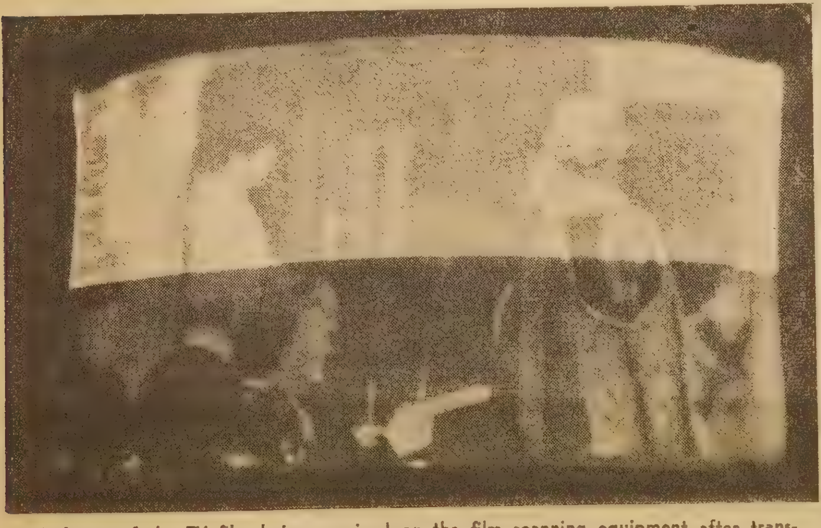
HANDLING MOVEMENT

The effective picture repetition frequency of 12½ per second results in satisfactory reproduction of most material excepting that in which rapid movement occurs. In this case special provision is made for the transmission of every frame of the original film. This, of course, doubles the transmitting time.

The new system uses a channel of the type normally used for transmitting music over the cable: such a chan has a nominal bandwidth of 6.4 k In order to limit the variations in group delay/frequency characteristic a value which can be corrected, it necessary to restrict the usable vi bandwidth to 4.5 kc/s.

Vestigial sideband transmission is u with a special form of negative-go amplitude modulation. The carrier quency is 5 kc/s and the whole of lower sideband is transmitted, the tige of the upper sideband extenc from 5 kc/s to 5.5 kc/s.

An additional problem results fr the need to remove from the circuit volume-range compressors and expanc which are normally used. This ma it more difficult to achieve a satis tory signal-to-noise ratio and there a special form of amplitude modula has been used in which the maxim depth of modulation considerably ceeds 100 per cent. That part of modulation envelope which extends yond the normal 100 per cent, or carrier, condition is "folded back" i positive going direction. This met of modulation results in an increas the effective depth of modulation thus also in the signal-to-noise ratic



A frame of the TV film being received on the film scanning equipment after transmission over the trans-Atlantic cable.

LOUDSPEAKERS
for

STEREO

Model 8MX, the latest addition to the Rola family of extended range loudspeakers, has been developed specially for use in stereophonic systems. This 8 inch loudspeaker requires only a 1.9 cubic foot capacity vented enclosure for peak performance, a feature which makes it ideal for two-speaker stereo units in the average-sized living room in which the large enclosures needed for the 12MX, 12-OX and 12UX take up too much space. Hear the Rola 8MX — its tonal quality will astound you!

ROLA MODEL 8MX STEREO LOUDSPEAKER SPECIFICATIONS:

Power handling capacity	7 watts peak
Diaphragm	
Fundamental resonance	65 c.p.s.
Frequency response	60 c.p.s. — 10 k.c.
Voice coil impedance	15 ohms at 400 c.p.s.
Air gap flux density	9,350 gausses
Total gap flux	36,800 lines
Principal dimensions:	
Overall diameter of diaphragm housing	8¹⁄₁₆"
Diameter of baffle opening	7"
Diameter of voice coil	1"
Depth of pad ring to rear	3½"
Finish:	
Baked enamel diaphragm housing, magnet shell black lacquered	
Transformer	Type C
Weight	1 lb 7¼ ozs. without transformer

ROLA

ROLA COMPANY (AUST.) PTY. LTD.

the system. In order to achieve the synchronous detection needed with this type of signal it is necessary to use a regenerated carrier at the receiving terminal and this must be locked in phase to the original transmitted carrier. The necessary bursts of carrier which occur during the synchronising signals are used for this purpose.

Another problem which has necessitated careful design in the equipment results from the fact that the line scanning frequency of 25 c/s makes it impossible to reduce the effects of mains hum by means of clamping circuits. It has therefore been necessary to keep hum throughout the system at an extremely low level. Should trouble from hum on the trans-Atlantic circuit be experienced some benefit can be achieved by a further reduction of line scanning frequency at the cost of a slight increase in transmission time. The precise choice of frequency will depend upon whether the hum is predominantly 50 c/s or 60 c/s.

SYNCHRONISING

As in other television systems a synchronising signal is transmitted at the beginning of each line-scanning period, in this case the full amplitude of the video signal being utilised for the triggering edge of the synchronising signal. The field synchronising signal consists of four similar pulses and protection is provided against these pulses interfering with the bursts of reference carrier which are used for oscillator locking.

Negative film will normally be used at the sending terminal but the equipment can deal with either negative or positive film.

Identical film equipments are used at both terminals of the system. At the sending end this apparatus operates as a flying-spot scanner, while at the receiving end it functions as a telerecording channel. The same cathode-ray tube is used for both purposes and is enclosed in a double mu-metal shield in order to minimise mains frequency interference.

The time required for each field scan is approximately eight seconds: a separate monitor tube with a long persistance phosphor reproduces a recognisable picture.

FILM TRACTION

The special film traction mechanism, which is operated by the synchronising signal, pulls down two film frames at a time. Twin optical systems are needed to telerecord simultaneously on two adjacent film frames, and very small lenses with a focal length of one inch and an aperture of f/8 were developed specially for this purpose.

In this new development by the B.B.C. Engineering Division. the General Post Office, the Canadian Overseas Telecommunications Corporation and the American Telephone and Telegraph Company have co-operated in putting trans-Atlantic cable circuits at the disposal of the B.B.C.

Features of this new B.B.C. system are protected by U.K. Patent Applications Numbers 18277/59, 18853/59, 16323/59.

TRANSISTORISED 2-WAY RADIO

A pretty model points to a transistorised two-way radio with very low battery drain.

International General Electric Company has unveiled an advance design of transistorised two-way radio equipment which it claims contains the highest powered transistorised models, the smallest sizes and the lowest battery drain ever to be made commercially available in the mobile communications field.

THE equipment will be available in units up to 75 watts—the highest output achieved to date in transistorised communications.

From the 75 watt category, the line ranges downward to 30 and 10 watt units in sizes as small as 8⅝in wide. 12in long and 4in high. Even with the size reduction, the units outperform larger conventional models.

The new line contains the fewest valves of any mobile radio equipment now marketed. Only three are used in lower wattage categories and four in 30 and 75 watt models.

MINIATURISATION

Miniaturisation of the line has been made possible by improved printed circuitry and modular construction manufacturing techniques.

When on "standby" (full sensitivity, ready to respond instantly to a call with full volume output), the 75 watt unit uses only 0.040 amps. This is so low that a driver can leave his radio in the "standby" position continuously and the drain on the car's battery would be like the drain of the vehicle's clock.

Previously, if a two-way radio were left on "standby" to receive calls for a prolonged period with the engine off, battery problems arose.

The new units installed in passenger cars have been left running continuously in winter and summer weather under normal operating conditions without the battery requiring attention.

Among engineering techniques which help conserve power is the elimination of crystal ovens. These are designed o of the unit, saving more than 1½ am with no loss in frequency stability.

A new circuit design makes possib 0.0005 per cent stability. Module heate automatically come on when case te peratures drop below zero degrees Cen grade and supply heat only when neede

The receiver and power supply a completely transistorised and use valves. The receiver is designed so t final transistors in the speaker opera only when a signal is present. As result of this type of squelch operatio drain is reduced to a minimum.

The first units to come off the p duction line will be manufactured f use in the 150-174 Mc band.

Units will be available in both narr band, for new licensees, and wide ba for replacement use in existing co munication systems where desired. T latter is engineered for economical a easy conversion to narrow band, w only two six coil IF strips needing placement when the user makes decision to convert.

Phase modulated transmitters are u in conjunction with compatible recei and power supplies to provide two-w communications on narrow band a wide band assignments.

The equipment has provisions either 12 volt or 24/12 volt power s plies. All units are interchangeable negative to positive ground. This important particularly to large fleet us of two-way radio who may have in in mixture of vehicles of several manu turers without common voltages ground polarity.

Australia has contributed a great deal to radio astronomy. This picture shows portion of the huge multiple interferometer aerial system erected at St. Mary's and operated by the radiophysics section of the C.S.I.R.O.

Radio Astronomy Sees To Limits Of Space

The new science of radio astronomy has opened up vast new vistas of a universe more immense than man had imagined could be possible. And yet the development in this field has only just begun.

by Calvin Walters

UNTIL about 10 years ago astronomers were forced to carry out their nvestigations by means of optical telecopes which enabled them to look hrough small gaps in the earth's atmoshere to the stars beyond.

The reason for this is that our atmoshere operates to provide a protective overing around the earth which acts s a shield against all kinds of harmful adiations which might otherwise reach s from outer space.

Among these harmful radiations are -rays, X-rays, ultra violet radiation and e intense form of cosmic rays.

This protective envelope has always een a hindrance to astronomers, for it as made available to them only a small and of wavelengths for the study of ars and planets. Up to comparatively cent times it has been only the band wavelengths comprising visible and near infra-red light which has been of any value.

It therefore follows that telescopes were constructed in such a way that the available wavelengths were concentrated by means of mirrors and lenses so that celestial phenomena could be observed directly by the eye or by means of photographs.

An enormous amount of valuable information has been accumulated by this method and it had been assumed that only bigger and better telescopes of the same kind could penetrate further into the cosmos.

The largest optical telescope ever built by man is the 200-inch giant erected on Mount Palomar in U.S.A. The power of this mighty instrument is such that it can observe light which has penetrated to us after a journey of some 2,000 million years through space.

In other language, it has a range of 2,000 million light years. A light year is the distance light travels in one year at a speed of 186 thousand miles per second. It is six million million miles.

Now if you multiply this figure by 2,000 million the answer is the distance that the Palomar telescope can see into space.

Such distances are just about incomprehensible to mere human beings, yet our story of radio astronomy reveals distances so much greater that the brain whirls at the vastness of space.

In the year 1931 a young radio engineer named Karl Jansky erected a special radio aerial in a small town of Holmdel in New Jersey.

JANSKY'S AERIAL

This aerial was designed to revolve and oscillate in a special manner for the purpose of scanning the skies in order to learn more about static interference to radio signals.

During his study, which incidentally contributed greatly to the invention of radar, Jansky noticed a peculiar type of radio noise which he was at a loss to explain.

It was a very weak but steady hissing sound which at times faded away and again rose in intensity. He studied it day after day and night after night. He examined charts and astronomical books in order to try and track down the source of the noise.

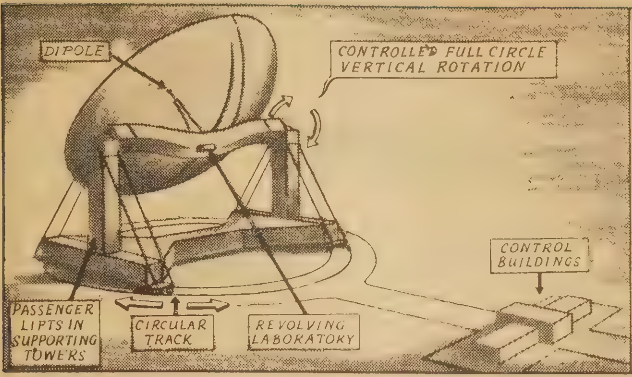
Jansky observed that the fluctuations in intensity of the signals coincided with the rotation of the celestial sphere. This sphere is an imaginary globe which encases the earth and to the inside of which is attached the stars and planets with the earth as a centre. Around this centre revolve the heavens and all that they contain.

Jansky's final assessment of the position gave birth to the new science of radio astronomy. He announced that the strange signals were coming from a source in the direction of the centre of the Milky Way. He thought that the centre of the Milky Way was probably the source itself, and as this centre is estimated to be about 26,000 light years from the earth it meant that the strange signals were coming from a distance of 156,000 million million miles.

From that time radio astronomy has advanced to a stage of high development although Jansky took no further interest in it himself.

Now it must not be supposed that the signals which come from outer space are generated by human beings or some other creatures on super radio transmitters located on the stars and planets. Not that such a possibility can be altogether ignored, for who are we to pre-

DIAGRAM SHOWING HOW RADIO TELESCOPE WORKS


DIPOLE
CONTROLLED FULL CIRCLE VERTICAL ROTATION
CONTROL BUILDINGS
PASSENGER LIFTS IN SUPPORTING TOWERS
CIRCULAR TRACK
REVOLVING LABORATORY

A sketch of the Jodrell Bank radio-telescope shows how it achieves vertical rotation by pivoting on the supporting towers. The control room which houses the initial amplifiers remains level as the aerial itself rotates.

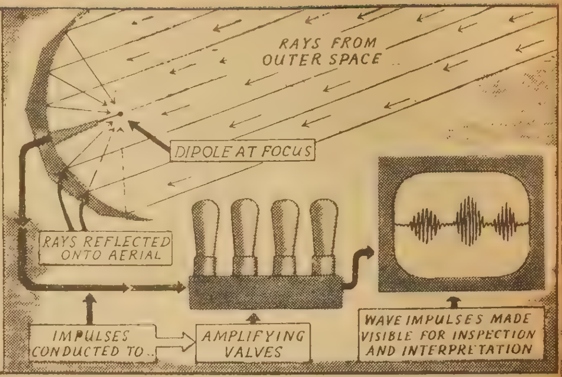

RAYS FROM OUTER SPACE
DIPOLE AT FOCUS
RAYS REFLECTED ONTO AERIAL
IMPULSES CONDUCTED TO
AMPLIFYING VALVES
WAVE IMPULSES MADE VISIBLE FOR INSPECTION AND INTERPRETATION

Diagram showing the essential elements of a radio telescope. The aerial, which collects invisible radiations from space, passes them through suitable amplifiers and thence to detection and display systems.

sume that we are the only creatures in the universe capable of inventing such things?

The signals are so widespread and of such a variety that it must be conceded that they are generated by some natural cause. Such causes are not wanting in nature. Every time an atomic particle shifts its position it causes an electrical oscillation.

Considering the number of atomic particles which jump back and forth in hot bodies and masses of hot gases and molten substances in the stars it is not surprising that the electrical oscillations produced must reach staggering proportion. These must produce an aggregation of impulses which far transcend any electromagnetic disturbance by man in his mightiest radio transmitter.

As there are always gaps in the atmospheric screen which will allow some kind of radio impulses to come through, the observation of the universe by radio receivers is possible for 24 hours a day.

This is quite the reverse from ordinary astronomy, which must rely on clear skies in order to make observations.

DIFFERENT METHODS

There is a vast difference, however, between the two methods. To the layman the observation of the sky through a large optical telescope is full of interest and beauty. The formation of stars and planets can be seen.

With radio astronomy, however, there is nothing to be seen. One only listens. To the average person today listening all the time is not of much interest. If you don't believe this, have a "dekko" in the door at the next meeting of the ladies' committee or the next annual meeting of the golf club.

There are many things which astronomers want to know and the two departments, namely, optical and radio, promise to reveal many things together which neither could do singly. We will enlarge upon these things later.

The reception of signals in a radio telescope is achieved in a manner similar to the reception of an ordinary radio receiver, but with a much larger and more complex apparatus.

The aerial of a radio telescope is in many cases a huge disc-shaped affair like a bowl. Signals from space hit the bowl of the aerial and bounce back to a focal point probably about 60 feet from the centre.

At this point a "half-wave dipole" aerial is suspended and the waves are here focused on the aerial. From here on the signals are fed into an amplifier, and the resulting impulse fed to a recorder. The latter is usually an automatic pen which writes the nature of the signal on a strip of moving paper.

The aerial is capable of movement so that it can be focused on to any portion of the heavens.

When one is listening to the amplified

Aerials of a different type are used with this interferometer erected at the Biurekan [illegible] observatory (Armenian S.S.R.) at an altitude of 1,700 metres above sea level. It has a mirror surface of 4,500 square metres.

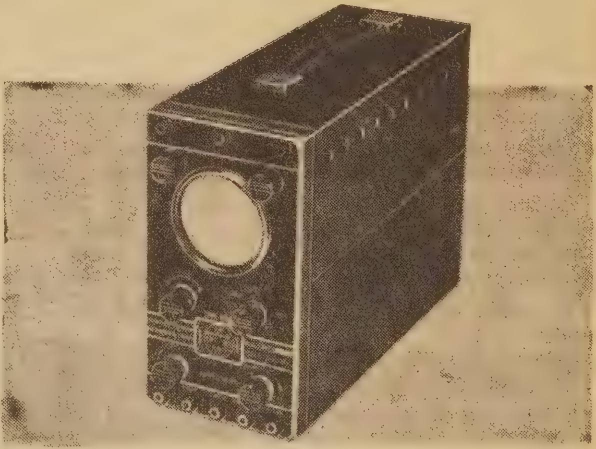
TV
TEST INSTRUMENTS

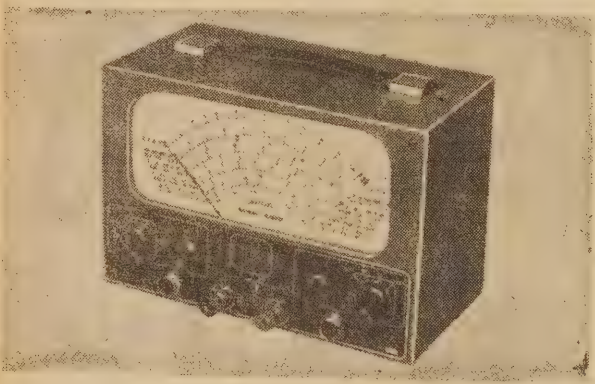
by

UNIVERSITY
GRAHAM

OSCILLOSCOPE 3 inch
MODEL TVR/C3

Small and portable, this Cathode Ray Oscilloscope is invaluable for TV and radio service work as well as industrial use. Although compact in size it contains the features of larger instruments, is flexible in use and offers many new features. It is suitable for the visual alignment of TV receivers, in conjunction with a sweep frequency oscillator and direct access is possible to both horizontal and vertical plates for examination of strong voltages. It can be supplied with a dulator probe for signal tracing work in TV chassis. Vertical amplifier response plus or minus 1db from 15 cycles to 150 Kc. and 6 db down at 1 megacycle.





MODEL TVR/EV

This smartly styled University Model Electronic Voltmeter is a basic measuring instrument for every branch of electronics. Model TVR/EV operates from 240 volts A.C. mains and is supplied with instruction booklet, circuit diagram D.C. voltage probe with inbuilt isolating resistor, A.C. voltage probe, ohms probe and earth lead. Available accessories are a 30,000 volt D.C. probe a radio frequency crystal probe up to 30 volts at 250 m.c. and a valve probe enabling radio frequency voltages to be read up to 1000 volts at 200 mc.

Truly this is a remarkable instrument, packed into the small size of 10in x 6½in x 5½in. You are invited to write for further details.

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You are invited to inspect our television and Radio Test Equipment under working conditions in a special demonstration room at our factory.

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16/FP.23

signals from a radio telescope, one is listening to nothing more than a jumble of (to us) meaningless sounds. But the experienced technician manages to pick out the one he wants by an adaptation of the following method.

Out of space comes a continual background of static produced by the never-ending radiation from all directions in outer space. This is called the "galactic background."

GALACTIC BACKGROUND

Let us assume that it is required to study signals from a known source of radiation in the Milky Way. It will be seen that if the aerial is pointed to a position where nothing but the galactic background is received the recording instrument will record only this disturbance.

If now the aerial is pointed towards the known source of radio signals the recording instrument will record the galactic background augmented by the signal from the celestial transmitter.

The general idea is to then subtract the previously recorded galactic background signals from the total signal. The remainder must then be the signal from the celestial transmitter.

In actual practice the radio astronomer does not move his aerial as outlined above. He only moves it when he wishes to examine a new area of the sky. The modern radio telescope does all the additions and subtractions automatically while in a fixed position.

In addition to the galactic background there is the hiss of the electronic valves in the receiver to contend with, but even this is adequately dealt with automatically.

SENSITIVE INSTRUMENT

The modern radio telescope is a remarkably sensitive instrument. So is the aerial attached to it. It has to be. For the power in a signal from a celestial source may have travelled more than 10,000 light years. The energy received is minute to say the least. It is in the region of one hundred billionth of a watt. Sometimes it is much weaker.

Yet the instrument can pick up this signal, amplify it and make it actuate a recording pen. One aerial in the Naval Research Laboratory in Washington is so sensitive that it can detect radio waves coming from a person's stomach from a distance of four miles.

Does it surprise you that your stomach transmits radio signals?

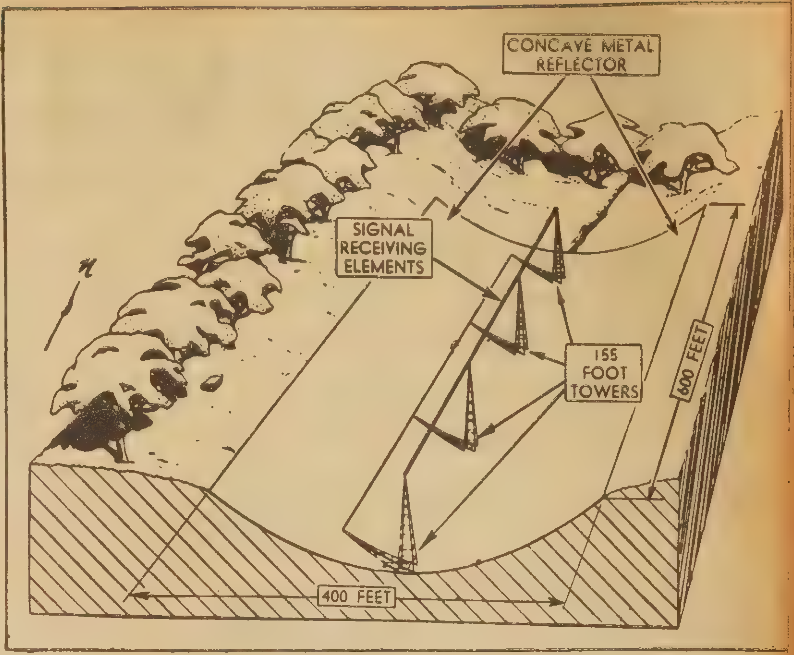
John Pfeiffer, in his book, "The Changing Universe," points out that the wall of the stomach transmits infra-red heat-waves, ultra-violet light waves, X-rays, radio waves and the full spectrum of light.

We have seen how electromagnetic waves are generated by the movement of atomic particles and collisions of atoms in outer space, how these give rise to radio signals which reach our planet and how they are picked up and recorded through radio telescopes. Of what use is this to the science of astronomy? What can be learned from such signals?

Perhaps the most spectacular example has to do with the sun's corona and the disturbances which are constantly taking place there.

It is by reason of the comparative nearness of our sun that it has been possible to demonstrate the remarkable capabilities of radio astronomy. Our sun is the only one which appears to us as a disc even through the most powerful optical telescope. This is because it is close to us.

The enormous temperatures of up to 40 million degrees at the sun's centre cause great explosions which release vast amounts of energy of which about 1,000-billion watts is released in the form of radio waves.



The University of Illinois is building a very powerful radio telescope in a ravine five miles south of Danville. It is expected to outrank even the Jodrell Bank telescope and makes use of a huge concave metal reflector 600ft long and 400ft across. Here is a sketch of the aerial system, which would not be "steerable" in the same way as the dish reflector types.

Portion of a tape showing how the strength of the signals from space is recorded on tape.

One of the great difficulties with whic
optical astronomers have to contend i
examining the sun is its intense light.

Such astronomers have had to wait fo
total eclipses in order to study the sun
corona, that flaming atmosphere whic
had previously been thought to sen
streamers only 500,000 miles out int
space. Because of the small amount c
light that is emitted by the corona
has not been possible to estimate th
true depth of this flaming atmosphere.

Strangely enough, the results obtaine
by radio astronomers give a picture quit
the reverse of that obtained by optic
telescopes. To such a telescope the dis
of the sun is the brightest while th
corona is the weakest in light emission.

To the radio telescope the disc of th
sun transmits the weakest signals whi
the corona transmits the strongest.

Radio astronomy can examine the su
at any old time and does not have t
wait for normal eclipses. Nevertheles
a type of eclipse has been used to dete
mine the depth of the sun's atmosphere.

Located in the constellation of Taur
is a known source of intense radi
activity which can be detected both da
and night.

Every year in the month of June th
signals from Taurus fade out because th
sun's corona passes across the constell
tion. The disc of the sun itself is abo
two million miles away from the rad
source in Taurus at the time of the fadi
out of the signals from the latter.

The first experiments along this li
were made by two radio astronome
Kenneth Machin and Graham Smith,
Cambridge, in 1954.

These two men focused their rad
telescope on Taurus early in June, 195

(Continued on Page 117)

Dual

AUTOMATIC PRECISION-BUILT CHANGERS and PLAYERS

1005 — RECORDCHANGER (Monaural)

Fully automatic with many features to guarantee faithful reproduction and reliability of operation. Automatic needle selection—built-in scratch filter—pause switch to control changing time cycle—roller glide selection of record size—tonearm lock and many other carefully designed functions. Fitted with the outstanding CDS3 Cartridge and DN2 twin sapphire needle assembly.

Price: Chassis only, £37/9/6; in Portable Case, £44/17/6.

1004 — RECORDCHANGER (Monaural)

An automatic changer combining simplicity of operation, high quality reproduction and reliability. Control is by three push buttons, "Start," "Stop" and "Repeat," and needle selection is by trigger control situated in the pickup head. Fitted with CDS3 Cartridge and DN2 twin sapphire needle assembly.

Price: Chassis only, £32/8/6; in Portable Case, £39/16/6.

1004S — RECORDCHANGER (Stereo)

This model has been specially designed to meet the high technical standards demanded for the efficient reproduction of stereo records. With a new control, the "Stereo Key," both channels can be connected in parallel, allowing conventional records to be played through stereo equipment with a new realism. With push-button control, roller glide indexing, tonearm lock, and many other features. Fitted with the CDS320/3 Stereo Cartridge and DN3 twin sapphire needle assembly.

Price: Chassis only £37/9/6; in Portable Case, £44/17/6.

1004 — T12 AUTO-PLAYER (Monaural)

A completely automatic player with push-button control—automatic roller glide indexing—pickup muting—drive roller release—auto cut-off—pickup arm lock and many other safety features. The possibility of damage caused by careless or hurried handling is virtually eliminated. Fitted wth CDS3 Cartridge and DN2 twin sapphire needle assembly.

Price: Chassis only, £28/10/-; in Portable Case, £35/7/6.

1004 — T12S AUTO-PLAYER (Stereo)

This model is the stereo version of model 1004-T12, incorporating the same features and gentle operations. Fitted with the CDS320/3 stereo cartridge and DN3 twin sapphire needle assembly, both Stereo and Monaural records can be played.

Price: Chassis only, £31/18/-; in Portable Case, £38/15/6.

295 — PLAYER (Monaural)

This popular model is particularly suitable for building in where space is limited, for use as a portable or for converting from single speed to four speed. Fitted with the CDS 2B Cartridge and DN2 twin sapphire needle assembly the same high quality and performance of the larger models is retained.

Price: Chassis only, £18/10/-: in Portable Case, £24/15/6

295A—"PARTY" PLAYER (Not illustrated)

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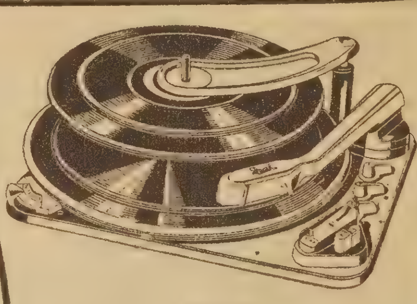

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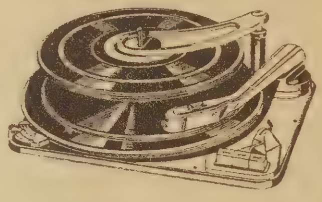

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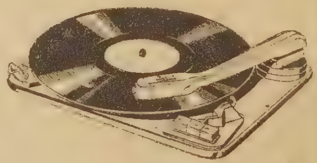

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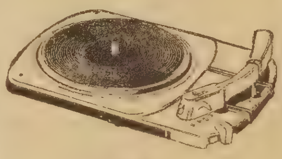

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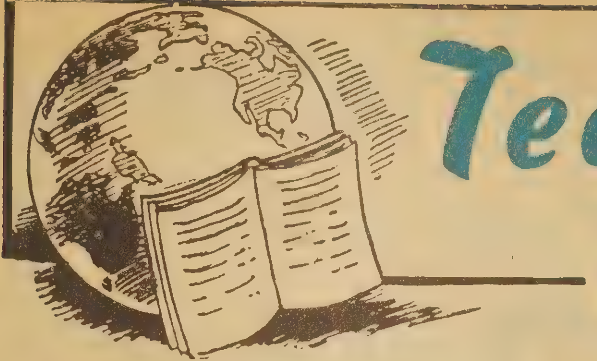


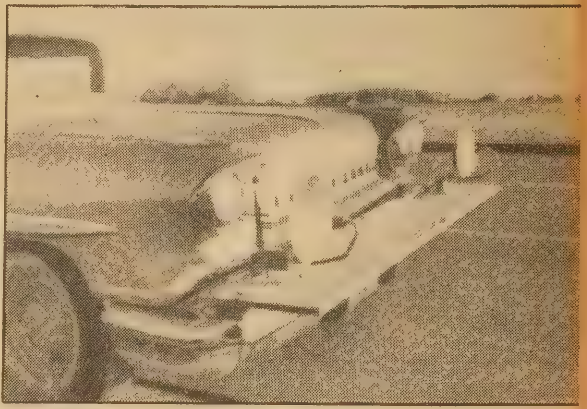
Technical Review

MICROWAVE PROXIMITY WARNING FOR CARS

Information on an experimental proximity warning radar for use in cars appears in a recent issue of "Electronics." The unit transmits a narrow unswept c-w beam in front of the car. The beam is reflected by any solid object in the car's path. Warning signals can be conveyed to the driver either aurally or by indicator lights—green for clear, flashing red for danger.

THE radar is being used on a new Cadillac experimental car. It is believed that the system will be valuable in preventing accidents on turnpikes, super highways and expressways, where it would warn a driver when he is approaching a car or object too closely or too rapidly.

The doppler radar is sensitive to objects up to 1,000ft ahead of the car, and it has been designed to increase frequency of the warning tone with increasing rate of approach and to increase volume with proximity. For example, if a car travelling 55 m.p.h. were approaching one ahead going 50 m.p.h. (5 m.p.h. rate of closure), the warning would be low in pitch. However, if the same car were approaching a stalled car (55 m.p.h. rate of closure), the warning would have higher pitch. Similarly, volume would be greater if the object were 200ft ahead than if it were 800ft ahead.



Breadboard version of radar developed by Delco. The system warns drivers when they are approaching objects too closely or too rapidly.

☆

The radar has two 10in aluminium reflectors mounted behind 10in long nose cones about 4ft apart on the front of the car. Transmitter and receiver are concealed in the front fenders.

A reflex klystron is used to generate power at 16,140 Mc, which is piped through wave guides to the feed horn of the transmitting antenna. The reflected energy is collected by the other reflector and its frequency is compared t that of the transmitter. The differenc frequency, detected by a crystal detecto is amplified by a transistor amplifier.

Another transistor circuit uses ampl tude and frequency data to switch green light off and a red light on fc dangerous conditions.

A total of five transistors are used i the combination amplifier-compute Two other transistors are used in a D to DC converter to provide power fc the klystron.

Steel backed with lead

THE strength of steel is combined with the corrosion resistance of lead in a new product of the British Non-Ferrous Metals Research Association. This is lead-clad steel, made by a pressure welding technique: the lead is rolled on to the steel base. Thicknesses up to ¼in have been superimposed on steel sheets 30in. wide and 4 to 5ft long in pilot scale trials.

Normally lead has been applied to steel vesesls by hand. A gas torch is used to flux a thin coating of lead to the surface and more lead is then deposited by melting until the desired thickness has been built up. The new method is expected to prove considerably cheaper, when it goes into commercial production. The lead-clad steel can be bent and worked into various shapes and joins can be welded without difficulty. It should be of particular interest to chemical engineers and is likely to be used in the manufacture of such units as pressure vessels and, especially, to make containers for sulphuric acid, to which the lead is immune.

STRONTIUM 90 MAY PRODUCE ELECTRICITY

RESEARCH and development has begun on a method to transform Strontium 90 into a source of additional power, the American Atomic Energy Commission reveals. The Nuclear division of Martin is working on a ground-based 100-watt generator.

Heat liberated by the spontaneous decay of the radioisotope would be changed into electrical energy by a highly efficient thermoelectric conversion system.

Because of the 28-year half-life of Strontium 90, the generator could be expected to produce continuous power for almost a decade without servicing or refuelling.

INTERMITTENT POWER

If it were linked to an energy-storage system, it could provide intermittent bursts of much higher energy than 100 watts (for a high-powered radio transmitter which might be required to broadcast for only a few minutes eac hour).

Several designs are being considere but the final generator will probably u more than 200,000 curies of Strontiu 90 and be about the size of a kett drum. The country's supply of refine Strontium 90 could be multiplied rea ily if additional separation facilities we set up.

Martin scientists estimate that by 197 the normal radioactive waste produc of the nation's nuclear energy industr will be great enough to supply 50 mi lion watts of heat energy. Assuming conversion efficiency of five per cen this would amount to 2½ million wat of electrical power.

Because of present-day cost, the mo practical uses of radioisotopic power a pear to lie in unattended power source where long life and reliability are vit factors. Remote weather stations, ai craft warning beacons and sea bu markers are possible civilian uses.

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ELECTRONICS CAN HELP THE MUTE TO SPEAK

ARTIFICIAL LARYNX REPLACES VOICE

The removal of the vocal cords—laryngectomy—literally leaves a person speechless, but no longer is it necessary for him to be dumb. With the aid of an artificial larynx he can speak again. In this article, by Aaron Nadell in Radio-Electronics, several types are described.

A NEW and expanding series of electrical and electronic devices has come into existence. It is flowering into still newer and even more ingenious varieties because surgical science is now saving the lives of victims of one variety of cancer. Formerly they died. Nowadays, however, sufferers from cancer of the larynx are often saved. If the diseased larynx is removed before the blight has had a chance to spread, the victim may live indefinitely. But he cannot speak. His vocal cords have been taken out. Various forms of artificial larynx — some illustrated here — have been developed to subtitute for the vocal cords.

As the number of survivors of that particular operation increases, so does the demand for artificial larynxes. And with a growing market for them, inventors and manufacturers have found it economically possible to devise new and improved variations. Some of the latest use very recent electronic circuitry and devices. Earlier models were electrical rather than electronic, and the very earliest were not even electrical but mechanical only.

The vocal chords create an audio-frequency vibration in the air of the mouth cavity. The frequency is a few hundred cycles, varying according to whether the person has a bass, tenor or soprano voice. In short, the vocal cords can sing, but they cannot speak. Speech modulation is added by the lips, cheeks and tongue.

An artificial larynx supplies the audio-frequency vibration that was formerly furnished by the vocal cords of the larynx. Once this has been done, the tongue, lips and cheeks modulate the vibration in the ordinary way.

The resulting speech is easy to understand, both directly and over the telephone. It has no inflection and therefore is a monotone, because none of the devices currently available is equipped for the continual change in tone frequency so easily obtained from natural vocal cords. Some existing devices have no tone adjustment at all. In others the tone can be reset, but not continually varied.

Learning to use an artificial larynx, regardless of its kind, is easy. The user simply talks. It is more difficult for a normal person to use one of the devices because he naturally adds the sound of his vocal cords and has to restrain himself consciously.

An injection - type unit made by Cooper Rand. Note the tube which the user inserts into his mouth.

METHODS IN USE

All artificial larynxes available today fall into two general types with respect to the method used to get the air vibration into the mouth. Going by the method used to create the vibration, artificial larynxes fall into three general types.

Conduction or injection puts the vibration into the mouth cavity. For the latter, an audio vibration, however generated, is injected into the mouth cavity through some form of air tube, which the user holds between his lips —preferably in the corner of his mouth.

In the conductive method, a vibrating surface is pressed against the throat underneath the chin. The vibration is mechanically conducted by the flesh of the throat to the base of the mouth underneath the tongue. The air inside the mouth is thus set into vibration.

Since transmission loss in the flesh conductor is high, battery drain is also high in these devices. One such unit operated at 1.5 watts. The demand of any injection type would be far lower,

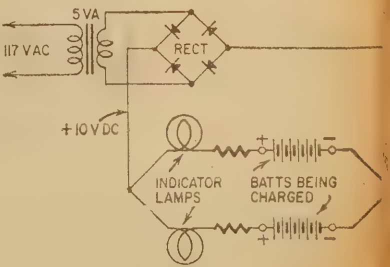
An artificial larynx made by Kett Engineering is a conduction type held against the throat. The battery is built in.

since normal speech power in ordinar conversation is in the order of 0.1 wat

In the injection type of artificia larynx, the injector — the device hel between the lips—is a rubber tube, plastic tube, or some kind of disguise device. One of these, currently availabl in the U.S. but manufactured in Italy looks like a pipe, and the user appear to be smoking. There is no smoke bu a simulated dull red glow shows insid the bowl.

An American manufacturer of an in jection type of electrolarynx, one whic uses a plastic tube injector, has unde consideration an artificial cigarett which will similarly disguise the injec tor. Many other variations are possibl

The conductive type of artificia larynx is manufactured in two form Both are convenient in size, roughl 1½in in diameter and about 4in lon One version is powered by a 6-volt ce carried in a jacket pocket and cabl connected, while the other is roughl half again as long and a cylindrical ba tery case forms part of it. The batter for this unit is a nickel-cadmium r



A battery charger supplied with the Kett larynx. It supplies the recommended charging current for either one or two batteries.

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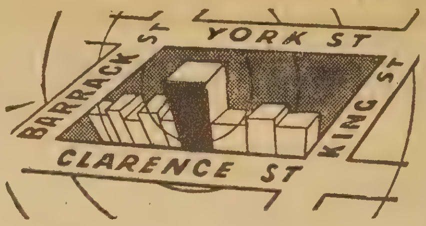

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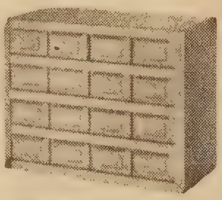

MODEL H
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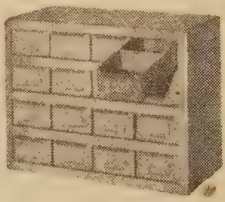
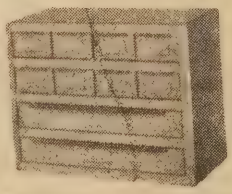


MODEL D
52/-
Cabinet 12" x 9" x 5½" 8 drawers 5½" x 2⅝" x 1½". 2 drawers 11" x 5½" x 1½".



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chargeable type, and a suitable charger is sold with the instrument.

The earliest form or prototype of the artificial larynx is not even electrical — it is mechanical. It is actuated by the user's breath, and depends on a vibrating reed, which is supplied in either of two pitches; one for men, another for women.

The breath-operated reed produces air vibrations which are injected into the user's mouth through a rubber tube or similar means. There are at least two suppliers of this form of artificial larynx—the New York Telephone Co. and the Mayo Clinic in Rochester, Minn.

The artificial larynx manufactured by Aurex, Inc., of Chicago is electrical but not electronic. Basically, it is a solenoid with a free flying-shuttle armature. The excursions of the solenoid are limited by an adjustable stop. The frequency or pitch of the vibration is altered with this adjustment. The battery is a conventional 6-volt zinc-carbon dry battery, specially shaped to fit in a pocket. Formerly, the manufacturer also offered a 4.5-volt battery, but this has been abandoned. In earlier models, the connecting cord was permanently wired to the instrument and plugged into the battery. In more recent models, there are plugs at both ends. Standard radio type Cinch-Jones plugs and jacks are used.

SPECIAL BATTERY EXPENSIVE

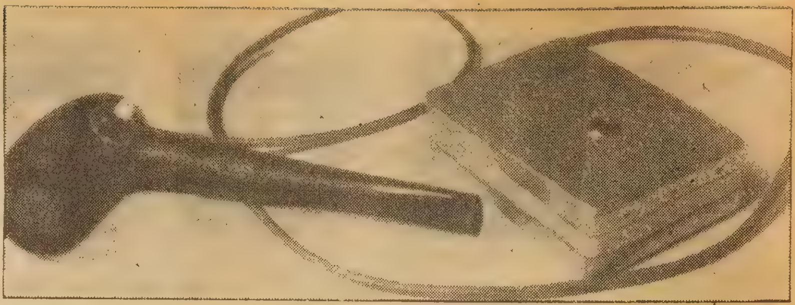
Since the special battery with its Cinch-Jones connectors is sold only by Aurex, some users, especially when they find their batteries are weak and no replacements are close at hand, have made their own batteries. This is done by wiring four standard flashlight cells in series, breaking the connector away from the exhausted battery and wiring it to the four-cell substitute.

Naturally, the special battery sells at a special price, leaving an extremely substantial margin between its cost and the cost of four flashlight cells. The larger ones last longer, but are heavy and clumsy. The smaller penlight cells are lighter and more convenient, but have a shorter service life.

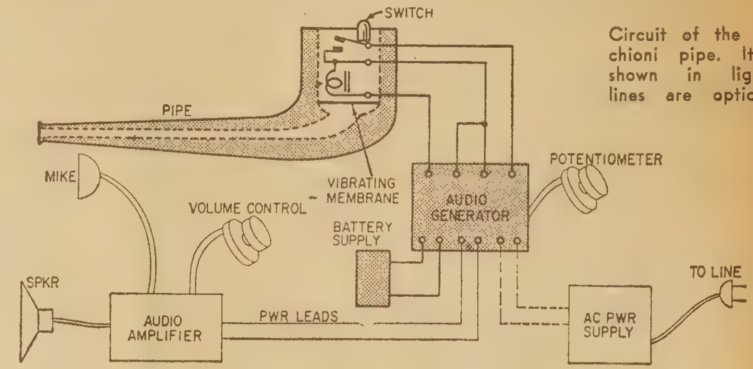
Aurex also makes a battery eliminator which conserves battery life, by letting you use the 117-volt line for power in office or home.

A similar instrument, with battery case part of the hand-held unit, is made by Kett Engineering Corp. of Santa Monica, Calif. Its batteries are made by Gulton Industries, Inc., of Metuchen, N.J. The cordless electrolarynx is sold as a package with a carrying case adapted to contain the instrument, a battery, two spare batteries and a battery charger. The charger plugs into any 117 volt AC line, and the user is cautioned to leave the cover of the carrying case open during recharging. On the other hand, batteries may be left on charge as long as three months with no harmful effect on their lives. According to the manufacturer, the charger uses "less power than one Christmas tree bulb." The size bulb is not stated.

Of very late design, the Cooper-Rand Speech Aid combines transistors, miniature components and printed circuitry. It consists essentially of two components. One is an electronic pulse generator, measuring 4¼in in its largest dimension and weighing 7oz. It is carried in the pocket or the hand. The other component is the tone generator or loudspeaker, 1in in diameter and 1in deep. A 4ft length of light thin cord interconnects the two. A plastic tube fits into the tone generator and conveys the air vibration to the mouth cavity.



Disguised as a pipe, the electrolarynx is made by Ticchioni of Italy.



Circuit of the Ticchioni pipe. Items shown in lighter lines are optional.

Among its other features, the Cooper-Rand instrument has a miniature radio type tone and volume controls.

The tone control can be set to suit the user's preference but does not provide the continual tone variation of the natural vocal cords. The volume control is an important improvement from the user's point of view, since without it the artificial speech is sometimes inaudibly weak in noisy locations and embarrassingly loud in quiet ones. The Cooper-Rand volume can be adjusted with a touch of the thumb.

The Speech Aid is supplied in a simulated leather-covered partition box measuring 6 x 4 x 3in. It consists, complete, of the transistor pulse generator, the tone generator, the interconnecting cord, a spare cord, 10 plastic tone-generator tubes, two spare batteries and an instruction booklet. Price is 200. It is manufactured by the Rand Development Corp., of Cleveland.

The Ticchioni pipe, product of Ticchioni, of Milan, Italy, consists of a battery-driven electronic frequency generator and a magnetic transducer that converts the electrical frequency into audio or air vibrations.

The transducer is concealed in the bowl of the pipe.

The press-to-talk button is located at the side of the pipe just where a smoker's thumb naturally rests. The frequency generator is worn in the pocket.

The tone of the Ticchioni pipe seemed to the present writer superior to — more natural and more pleasing than — the tone of any of the other speech aid devices described here, excellent though some of them are. The complete unit includes both a battery charger and a battery eliminator.

The extent of the need for these devices is difficult to estimate. The pharmaceutical house of Pfizer estimates that 6,000 patients yearly develop this disease of the larynx in the United States.

"HOT PARTICLES"

WEST GERMAN scientists met in Schwalbach, near Wiesbaden, last month to discuss the implications of "hot particles" which have been observed in the air during the last year.

These particles are too small to be observed by microscope, but they can be recognised by characteristic black spots which they make on photographic films.

It seems that this is a form of fallout from nuclear bombs, because the particles first appeared after tests in the U.S.A. and the U.S.S.R. and their number seems to diminish in the intervals between tests. No such fallout was observed after earlier tests. Professor Scheding, of Vienna, an observer at the conference, said that he had found hot particles generating daughter particles.

There is a wide divergence of measurement of the density of these particles: Erlangen noted 30 within a year and Vienna found about 900. This variation may be partly due to differences in the definition of a hot particle.

Professor Sittkus, of the meteorological station of Freiburg in Breisgau, counted all particles with an activity of more than 50 micromicrocuries, and according to his thorough observations there is about one particle in 500 cubic metres of air.

Obviously these strongly radio-active sources, whose chemical composition is so far unknown, can enter human lungs by respiration and settle there.

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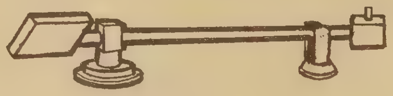

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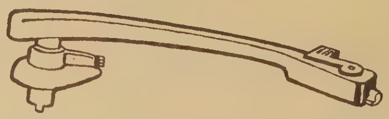

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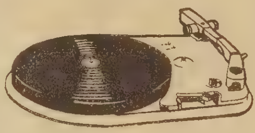

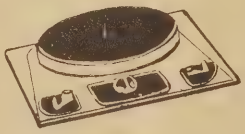

GARRARD 301 TRANSCRIPTION MOTOR
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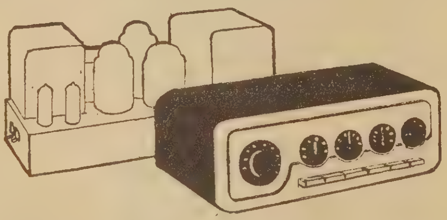
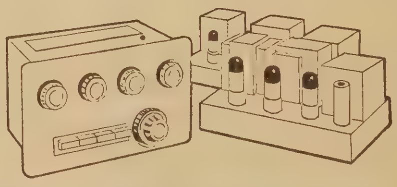


QUAD 22
A development from the world renowned Quad 11, Quad 22 incorporates refinements in design, greater flexibility of input and includes facilities for either stereo or monaural. Operates from discs, tape, radio or microphone, single channel or stereo. Power output: 15 watts throughout the range 20-20,000 c/s.



ROGERS R.D. JUNIOR AMPLIFIER AND STEREO-CONTROL UNIT.
This entirely new unit incorporates every essential for High-Fidelity reproduction from tape, records or radio. Can also be used for monaural recordings. The control unit may be used with two R.D. Junior amplifiers (20 watts output), or two R.D. Cadets (10 watts output), or one of each!

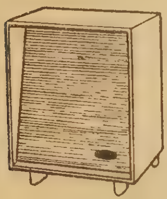
UNITED RADIO DISTRIBUTORS

STEREO IN HI-FI

with control unit, and a second speaker system.

Write, telephone or visit, at U.R.D. you'll get all the help and advice you need.

Stereo without High Fidelity is like a picture without colour.

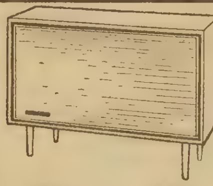


Trebax

Axiom 300

GOODMANS SHERWOOD 11

Balanced 3 — Radiator Twin-unit, Full-range, High-Fidelity Loudspeaker System. Bass and middle registers reproduced by an Axiom 300. At 5 Kc/s. signal is transferred to Trebax pressure-driven, high-frequency unit. Overall range, 30 c/s.-16,000 c/s. Capacity: 15 watts. Dimensions: 25½" x 23½" x 20½". Polished walnut or pine. Plans available.



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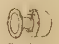

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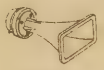
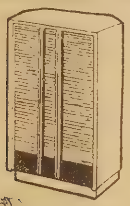


Midax 650

Audiom 60

GOODMANS AXIOM 15/4

Entirely new quadruple Radiator Full-range, High-Fidelity Loudspeaker System. Overall frequency range, 30 c/s.-16,000 c/s. Bass Unit: Audiom 60 12" single-cone unit (30-950 c/s.). Mid Range: Midax 650 pressure-driven horn unit (950 c/s.-5,000 c/s.). High Frequency: Two Trebax pressure-driven horn units (5,000 c/s.-16,000 c/s.). Capacity: 15 watts. Dimensions: 19" (plus 7" legs) x 36½" x 13¾".



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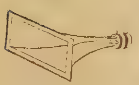
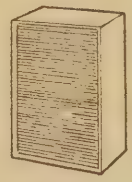


Midax 400

Audiom 80

GOODMANS 325

Complete Three-unit High-Fidelity System. Overall frequency range: 30 c/s.-16,000 c/s. Bass Unit: Audiom 30 15" single-cone unit (30 c/s.-750 c/s.). Mid Range: Midax 400 pressure-driven horn unit (750 c/s.-5,000 c/s.). High-Frequency: Trebax pressure-driven horn unit (5,000 c/s.-16,000 c/s.). Capacity: 25 watts. Dimensions: 33" x 22" x 20½".



Axiette

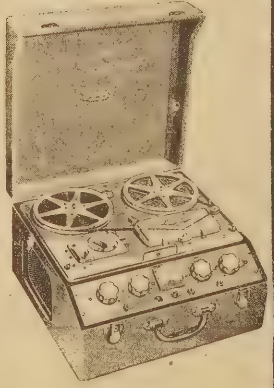
GOODMANS AXIETTE CABINET

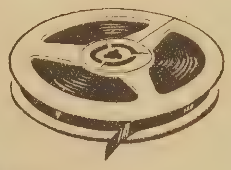
Single-unit High-Fidelity Loudspeaker System. Frequency Range: 40 c/s.-15,000 c/s. Axiette speaker gives excellent angular coverage at all frequencies. Power output—6 watts, yet only 8 inches in diameter. Operating at normal room volume, the most critical listener would be unable to distinguish between Axiette and more expensive systems.
Dimensions: 24" x 17" x 9¾".
Ideal for Stereo.

FERROGRAPH SERIES 4

In this new development of the incomparable Ferrograph series, there are eight important design improvements. Every Series 4 is readily adaptable for a variety of applications. For example, the new head cover permits many head changes and additions. Also Series 4A is easily converted to a Series 4S merely by plugging in additional stereo head.

Series 4A/N, 4S/H: 3¾ x 7½ i.p.s.
Series 4A/H, 4S/H: 7½ x 15 i.p.s.
Stere-ad unit as required.





MSS MASTERTAPE

The only tape polished on both sides to almost eliminate surface noise. As a result of the fine finish of the working surface, wear is almost negligible and intimate contact with the recording and replay heads is assured. 7-inch spools. Standard: 1,200 ft. Long Play: 1,800 ft.

PTY. LTD.

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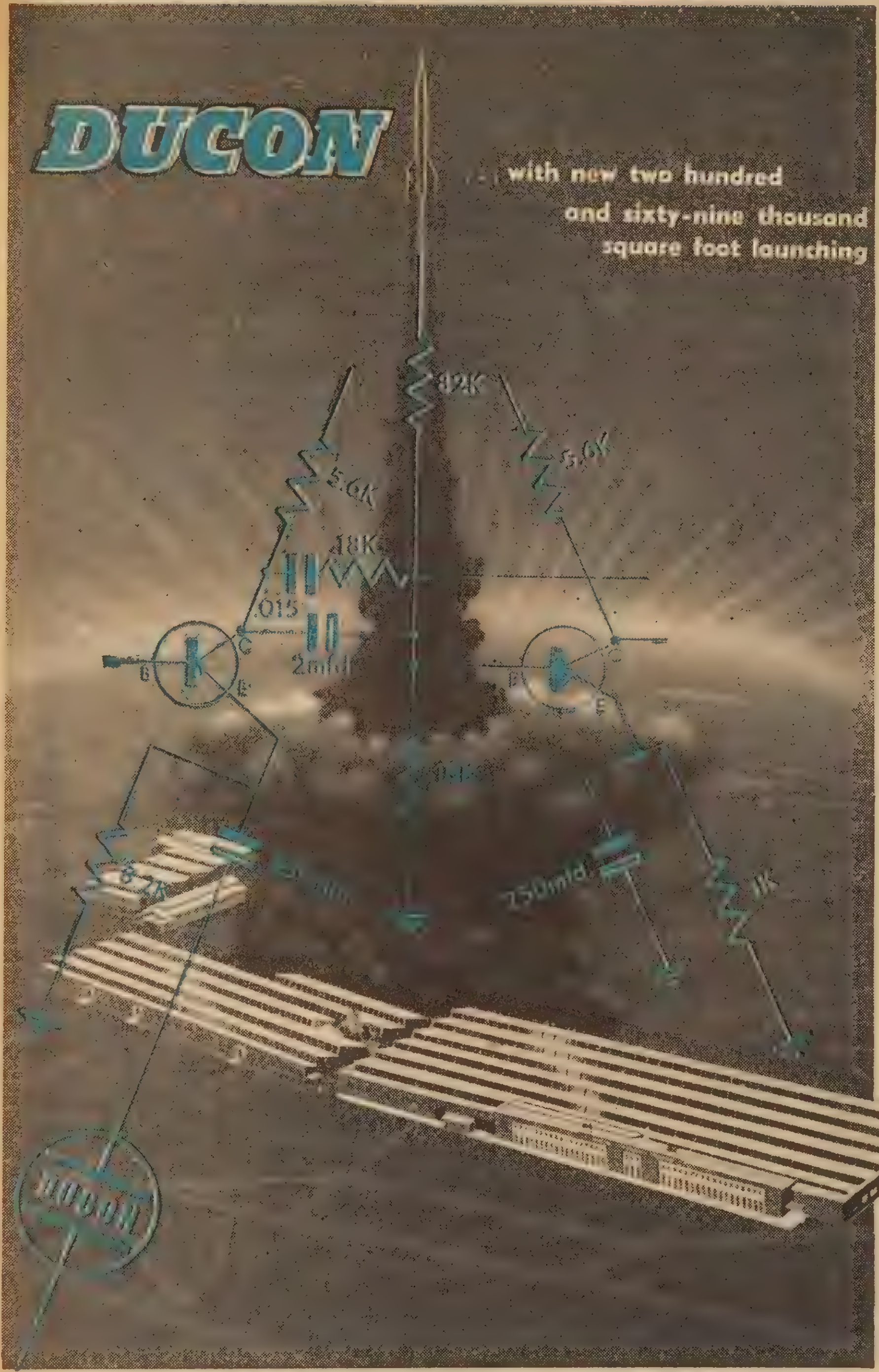


DUCON . . . with new two hundred and sixty-nine thousand square foot launching platform . . .* Progresses with Electronics

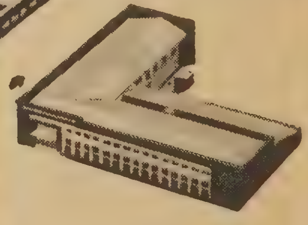
Furthering the interests of the electronics industry, Ducon recently almost doubled its production capacity, and greatly enlarged the research scope of Leightonfield Works, thus again aptly timing the completion of an expansion program planned to provide the electronics industry with continuing service. By regular exchange of key engineering personnel with overseas organisations . . . by research and manufacturing technique partnerships with the world's leading electronic components organisations, Ducon has maintained (since 1932) its position as Australia's most reliable and biggest manufacturer in this specialised field

Ducon's new 269,460 square foot production tool at Leightonfield is a solid platform from which to provide still greater service . . . a practical, functional foundation to technical know-how and production capacity to produce in quantity, and deliver on schedule, an ever-widening range of components required by the fastest-growing industry civilisation has known.

Ducon Products include:—

- **Paper capacitors**
- **Mica capacitors**
- **Plastic film capacitors**
- **Ceramic capacitors**
- **Electrolytic capacitors**
- **Resistors**
- **Potentiometers**
- **Switches**
- **Interval timer switches**
- **Ferramics**
- **Ceramics**
- **Ceramic-to-metal seals**
- **Mica products**
- **Cardboard containers, tubes**
- **Mallory mercury batteries**

**** Ducon's expansion program has increased production area from 186,000 to 269,460 square feet.***



Expect more . . . get more from DUCON

DUCON CONDENSER LIMITED, Leightonfield Works, Villawood, N.S.W. UB0133

NEWS AND VIEWS OF THE MONTH

Cheaper atom power

THE first of a new generation of nuclear reactors, which may halve the cost of nuclear power, is almost complete.

It is located at the new Winfrith Heath Atomic Research Station in Dorset.

The Zenith reactor at the plant will provide data for the construction of the internationally owned reactor to be known as the "Dragon Project."

The Dragon Project, to cost £13.6 million, will be shared between 12 European countries.

It is due to begin next year.

It is anticipated that there will eventually be six reactors on the site at Winfrith Heath, although the director, Mr D. W. Fry, does not envisage more than three being in operation at any one time

Rubies reduce noise

THE Weapons Research Establishment at Salisbury has begun testing pink walnut-size synthetic rubies.

It is testing the ruby crystals in an effort to double the ranges at which radar and radio-telescopes can track weak signals from missiles or satellites.

The ruby crystals can magnify very weak radio signals without introducing their own inherent noise as do thermionic valves or transistors.

Atfer the ruby crystals have located the weak signals, thermionic valves or transistors will be used in later stages of amplification.

Similar tests are being conducted in Sydney by the C.S.I.R.O., as well as in America and other countries.

It is possible that this new method may be used later in amplifying radio-telephone conversations.

Sound in medicine

NEURO-SURGEON Dr Peter Lindstrom, who was actress Ingrid Bergman's first husband, is using high frequency sound waves to treat patients with disabling emotional disturbances.

He reports encouraging results among a high percentage of the first patients ever to be treated by the new method.

Dr Lindstrom, head of the Division of Neuro-Surgery at the University of Utah College of Surgery, has been experimenting since 1955.

He reports that of 75 psycho-neurotic patients treated about 80 per cent have enjoyed "prolonged and gratifying improvement."

The technique involves ultrasonic irradiation of the frontal lobes, which comprise the emotion-controlling part of the human brain.

A large area is irradiated without causing actual physical damage.

The patient does not undergo personality changes or loss of memory.

Fresh water from salt

AN American firm has installed a plant for making fresh water from sea water to serve the island of Aruba on which there are 55,000 persons.

The installations, described as the world's largest, cost 10,600,000 dollars (£A4,703,445) to construct.

Aruba, off the coast of Venezuela, is the site of a large oil refinery. Rainfall is so slight it cannot provide even a secondary source of water.

Since completion of the plant, work has begun on elaborate tourist facilities on the island, and on a "hydroponics," or soilless, farm, which would produce fresh fruit and vegetables which now had to be imported.

Meanwhile at Syracuse (New York), a Government-sponsored attempt to obtain fresh water from the sea is expected to begin on a test basis in September.

Researchers have been constructing a maze of pipes and tanks which will form a pilot plant able to change sea water into fresh water at a rate of 15,000 gallons a day, using a new "direct freeze" process.

With the direct-freeze method sea water is sprayed into a tank.

A small portion evaporates in a partial vacuum, which allows the removal of heat at a low temperature.

The remainder of the water freezes into a slush of pure ice crystals surrounded by brine.

The heat originally removed from the sea water to permit freezing passes through the refrigerating machinery and is used again to turn the ice crystals back into water.

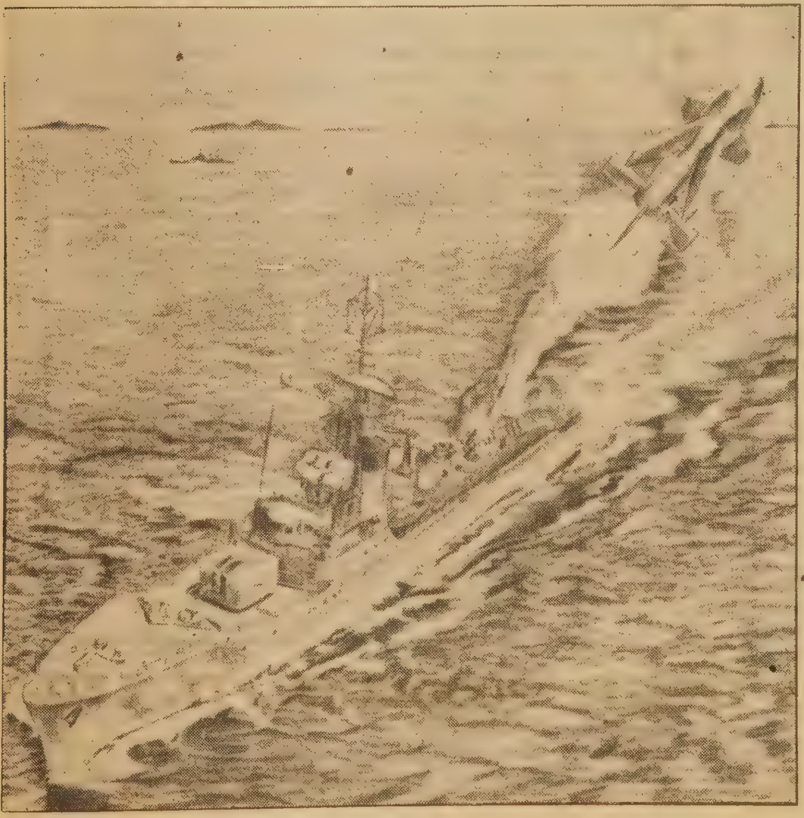
New minature diode

NEW concepts in the design of microwave equipment used in radar, communications, missiles, satellites and electronic systems for national defence, are visualised by a new line of microwave diodes announced by Sylvania Electric Products Inc.

"Micro-Min" diodes, which are point contact microwave diodes hermetically sealed in a miniature glass envelope, will form an integral part of a microwave circuit, in waveguide, coaxial line, microwave strip transmission line, or any other transmission line.

Conventional microwave diodes employ a ceramic or metal envelope up to 10 times greater in size than the new diodes. "Micro-Min" diodes have a maximum length of .3in and a maximum diameter of .105in. In addition to meeting the electrical performance of their larger counterparts, "Micro-Min" diodes are equivalent in ruggedness and stability

Among the types made available by Sylvania are detector diodes ranging in frequencies from 100 Mc to 9,000 Mc. and mixer diodes in frequencies from 3,000 to 9,000 Mc.

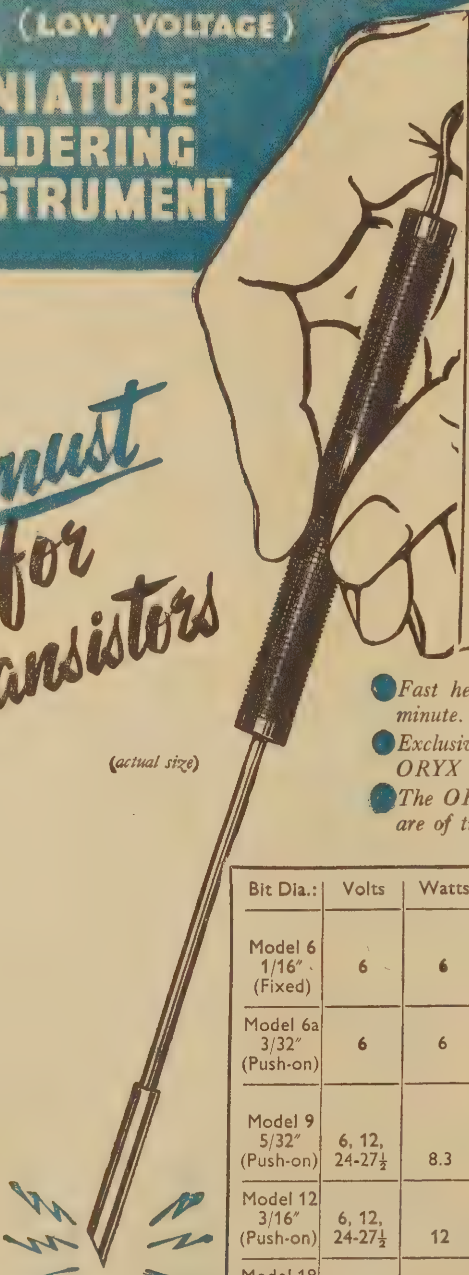


SEACAT SHOWS ITS CLAWS—Artist's impression of the Seacat, new guided missile for the Royal Navy, being launched from a warship. It has been developed by Short Brothers and Harland Ltd. to replace the 40mm gun as the Navy's standard close-range anti-aircraft weapon. It is powered by a solid fuel motor and will be used against enemy aircraft.

ORYX

(LOW VOLTAGE)

MINIATURE SOLDERING INSTRUMENT



A must for Transistors

(*actual size*)

PROTECT YOUR TRANSISTORS WITH ORYX

There is a danger of damage when soldering to transistor leads, due to A.C. leakage currents. The use of a low-voltage transformer supply, with earthed secondary is therefore recommended. Take care also that too much heat is not applied to flying leads. The ORYX iron, and a heat-sink such as heavy pliers gripping the lead between the contact point and the transistor, will ensure protection.

- *Fast heating element, ready for operation in less than one minute.*
- *Exclusive design features resulting in universal acceptance of ORYX as the standard miniature soldering instrument.*
- *The ORYX long life element will outlast several bits which are of tight push-on fit.*

Bit Dia.:	Volts	Watts	Nett Weight	Length	Recommended Use
Model 6 1/16″ (Fixed)	6	6	0.25 oz.	6″	Electrical measuring instrument fine assemblies, hairsprings, R.F. pick-up and speech coils, hearing aid sub-assemblies, etc.
Model 6a 3/32″ (Push-on)	6	6	0.25 oz.	6″	As for Model 6 (for extremely delicate work only).
Model 9 5/32″ (Push-on)	6, 12, 24-27½	8.3	0.25 oz.	6″	Hearing Aids, Radio and TV Sub-assemblies, Coils, Electronic Instruments, Model Construction, Electro-Medical, etc.
Model 12 3/16″ (Push-on)	6, 12, 24-27½	12	0.5 oz.	6.25″	Radio, Television, and Telecommunications assemblies.
Model 18 3/16″ (Push-on)	6	18	0.75 oz.	7¼″	For heavier work, heat capacity equivalent to that of most 80 watt soldering irons.

Australian Distributors:

MANUFACTURERS SPECIAL PRODUCTS PTY. LTD.

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MELBOURNE : Amalgamated Wireless (Australasia) Ltd. ADELAIDE : Newton McLaren Ltd.
PERTH : Nicholsons Ltd., Carlisle & Co. Ltd. HOBART : Noyes Bros. Ltd. BRISBANE : Chandlers Ltd.

MSP3.58

H-Power for space travel

THE Republic Aviation Company has announced that it is working on an interplanetary spaceship that would be powered by forces scientists are using in attempts to tame the H-bomb.

A company official said the company had built and tested "an experimental plasma propulsion system," expected to be the prototype of a craft weighing 27,300lb and capable of carrying a 5,000lb payload to Mars.

He described the system at a military electronics convention.

It used the so-called "pinch effect," being studied as one possible means of confining and controlling H-bomb fusion reactions within walls consisting of magnetic lines of force.

A plasma is a gas which has been heated until it acquires electrical charges.

Under the influence of electrical and magnetic fields, electrified gas can be pinched in or constricted until the particles attain high temperatures.

Heavy jolts or pulses of electricity repeated 500 times a second give the plasma high potential velocity.

Big space ship

ANOTHER space ship, of 1,000 tons, is being developed in America driven by atomic "firecrackers."

The Defence Department's Advanced Research Projects Agency has the development under way.

The agency is working on the project under the strictest security measures at John Jay Hopkins Research Laboratory, San Diego (California).

The agency has revealed only that a series of small nuclear explosions will propel the space ship.

Air Force and scientific sources in Los Angeles described the idea as "something like setting off firecrackers behind a tin can—only this will use one hell of a powerful firecracker."

One expert said: "It's as simple as it sounds.

"You just set off atomic bombs behind the ship—not all at once, but in small packages, to control the ship's acceleration.

"There are several ways of doing it, and several studies are under way.

"One way is to have a ship with a flat rear end. Then you just explode small bombs against its rear.

"When the bomb explodes you will have an explosive force shooting out in all directions.

"But a fraction of the force will be expended against the ship, imparting some impact energy to the craft."

Space radio planned

AMONG the frequency allocations to be debated at the ITU conference in Geneva later this year are those set down for communication to space ships and satellites.

The frequency allocations under discussion will be valid for the next 11 years, during which time it is expected that they will be required for this new service.

The channels will allow for communication both between the earth and space ships, and between the ships themselves.

They are mostly at very high frequencies where no difficulty is anticipated in covering considerable distances with low power.

NOVA

The Fabulous 2-Speed "Daiwa"

Complete with highest class dynamic microphone, earphone lead.

FOR ONLY **£69/10/-**

ONE ONLY SHOP-SOILED £64/10/-

RUSH—VERY LIMITED STOCK

"NOVA"-COLLARO

All Collaro and Nova features combined!

THE LOWEST PRICED 3 SPEED HI-FI RECORDERS IN AUSTRALIA

SPEED FREQUENCY COMPENSATION ALL PUSH-BUTTON.
AUTOMATICALLY SWITCHED 3-CONTROL.
DOUBLE SENSITIVITY MAGIC EYE. (Maximum/Minimum indication at one glance.)
MONITORING WHILST RECORDING.
HI-FI AMPLIFIER FOR PLAYING RECORDS, ETC., AND P.A.
BUILT-IN RADIOTUNER AVAILABLE IN SINGLE ENDED (5.5 WATT) or ULTRA LINEAR PUSH-PULL (10 Watt).

LOWEST PRICE OF ANY HI-FI THREE-SPEED RECORDER EVER ACHIEVED IN AUSTRALIA.

You cannot miss this opportunity if you contemplate buying a tape recorder. ALSO AVAILABLE: COLLARO DECK, single or with Pre-amplifier only (INCORPORATING THE AUTOMATIC 3-SPEED COMPENSATION) and Magic Eye level Indicator, with or without power supply. Compensation and Oscillator Coils for this deck.

STILL IN THE FOREFRONT

NOVA "STUDIO" PROFESSIONAL

3 speed for the Connoisseur NOVA "SONIC" MIDGET LIGHTWEIGHT PUSH-BUTTON for OFFICE AND HOME.

BARGAINS:—

Nova 2-speed deck, Recording Amplifier, complete, £25
3-speed NOVA Studio recorder slightly used with Tuner and level meter £92 only.

2-Speed Decks: Fast forward and rewind. Excellent differential brakes. Guaranteed Frequency Response. Out they go for £29/5/
Collaro Deck (one left), new, but slightly scratched panel £36/15/

Ferrographs, Grundigs, Vortexions, Ericorde, New and Second-hand.

write today about "NOVAS." **"ON APPROVAL"** scheme which will enable you to obtain our equipment for a FREE test without obligation to buy

STEREOPHONIC

AMPLIFIERS FOR DISC AND TAPE RECORDERS, DECKS AND HEADS.

10 Watt Transistor Amplifier 12 Volt.
50c/s-15Kc/s 4½ x 3½ x 4 only £34.
Ultralinear O/P Transformers

FOR EVERY TYPE OF VALVE, "Nova" pioneered "Ultralinear" in Australia
UP to 12 WATT (2 impedances), £4/17/6. Up to 20 WATT (2 impedances), £6/3/.
Other types on application.
O/P Transformers for Playmaster 1 to 11 and for the Mullard 3-3, 5-10 and 20-watt Amplifier Transformers Kit Set.

TV TRANSFORMERS for R. and H., Philips, A.W.A., Circuits.
TRANSISTOR TRANSFORMERS for all Circuits.
TRANSFORMERS ON MU-METAL, RADIO METAL and C-CORES.

REWINDS and any type transformers or coil to customer's specifications. Call, ring or write for quote on your needs.

TERMS ON LOW INTEREST

For further details contact your dealer or

"NOVA"

311 SUSSEX ST., SYDNEY. BM6138-BM2350,
also 122 William Street, Sydney.
Open Saturday Mornings and week nights.

CANBERRA. CANBERRA ELECTRONICS, 4 Lansborough St., Griffith, A.C.T. X1324.
BRISBANE: STARLIGHT RECORDING CO., Penney's Building. B7336.

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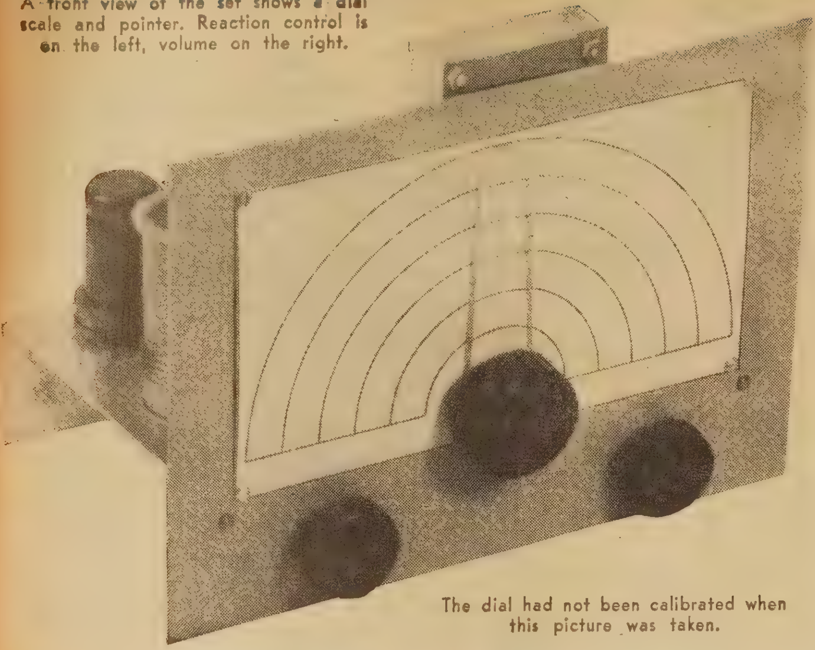


A front view of the set shows a dial scale and pointer. Reaction control is on the left, volume on the right.

The dial had not been calibrated when this picture was taken.

A Simple Receiver Tuning All Bands

Here is our latest version of that ever popular beginner's set; the simple regenerative set suitable for both broadcast and shortwave listening. Designed to suit the most modest budget, it is an ideal first set for any beginner, providing an easy introduction to set building and many hours of fun listening to local and overseas broadcasts.

by Philip Watson

THE simple regenerative set goes back a long way in the history of radio, and many classic "firsts" were chalked up against it in the early days, when there was little better available. Today, in spite of the vast improvements made to communication receivers, it still has a fascination and attraction all its own.

Much of this is due to the fact that it is basically a simple set, sometimes limited to one valve and a handful of minor components, yet capable of truly amazing results when properly handled. Ask any old timer who cut his radio teeth on such a set, and he will come up with a whole list of achievements to its credit.

THE GOOD OLD DAYS!

As a matter of fact, the morning tea discussion which preceded this project brought forth just such nostalgic reminicences from various staff members. One concerned a humble set, built on a wooden baseboard, wired with discarded bell wire, with a coil wound on a scrap of broom handle forced into an old valve base, and using one simple triode valve, which thrilled its creator by bringing in signals from London and Moscow.

To be sure, such sets needed to be handled with skill (and still do) but that was half the thrill. And part of the other half was trying to convince one's non-technical friends that London could be received on one valve. Very few would believe it until it was demonstrated. Some of them not even then!

Another reason that this set has kept its place with experimenters is that many advances which have improved the larger sets, particularly in regard to valve characteristics, have also been applicable to this simple circuitry, so that it has been able to keep pace with its larger brothers.

And finally, the array of cheap valves and other components available through disposals makes these even more attractive for our younger readers. So, if you feel the urge to probe the mysteries of the short-wave bands, listen to the "hams," the overseas transmitters, the small boats along the coast, and a host of other interesting signals, this is an ideal set for you.

There are many forms which these sets can take and, in any one version, there will have to be a number of decisions as to which is the best of several possible approaches, taking into account performance, convenience, economy, likely user requirements, etc.

For example; shall the set be battery or mains powered? Is it to be purely a short-wave set or is the broadcast band required as well? Is complete short-wave coverage required, or only specific bands, such as the amateur bands? What (general) types of valves should be employed? What is the best solution to the dial problem? Plug-in or switched coils? And so on.

FOR AND AGAINST

As is usually the case, one can make a convincing argument for most of the possible approaches, so that no one design is likely to please everybody. For this reason, there might well be a case for us to describe another set in the near future incorporating all the things we haven't done in this one.

In the meantime we feel that this design will appeal to a great many of our younger readers, particularly those whose pocket money calls for strict budgeting.

In fact, this has been one of the governing factors we have kept in mind right from the set's inception; to take advantage of low cost components wherever possible and produce a set at the lowest cost consistent with performance.

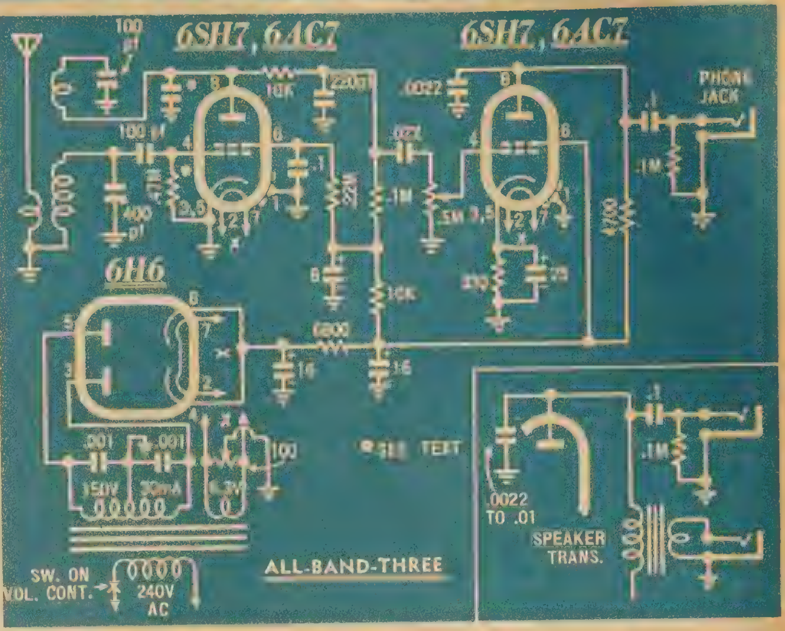
Economy was one reason we chose to make the set mains operated. The way prices are at the moment it is possible to make an AC power supply at a very moderate cost; possibly less than a set of batteries. And, since batteries have a very limited life, it is very hard to make a case for them.

BATTERY PROBLEMS

It is true that the circuit may appear simpler, but the fact is that batteries and directly heated valves always present a risk of blown filaments when some little thing goes wrong in the HT circuit. And valves cost money, too!

It may also be claimed that batteries are safer than the mains, and, in theory at least, this may be true. However, we seriously doubt whether this presents any real hazard. Anyone sufficiently interested in radio to tackle such a set will have enough sense to keep his fingers clear of the two mains terminals, and

IDEAL SET FOR THE BEGINNER



The circuit has been kept deliberately simple. The 6SH7 appears to be the best valve for the detector.

the rest of the set is relatively harmless.

Suitable transformers are available in a number of brands for around 23/, including one of the latest releases which is both smaller and cheaper than previous versions by the same maker.

And the rectifier valve will cost you the grand sum of 1/6! No, it's not a misprint; type 6H6GT valves are available (new) through disposals for this price, and are nicely suited to a little set like this. The total current drain is almost exactly 8 mA; the maximum rating on these valves. However, even had it been a little higher, such an arrangement would appear to be justified since replacement costs are too small to worry about.

And our experience has been that in service of this kind, the 6H6 is virtually unkillable, and its ratings, which provide for its use as a rectifier, are most conservative.

Remember what we did to it in our six-inch TV set! Yet the original valves are still operating in it.

CHEAP VALVES

The remaining components are mainly the electrolytics. Unfortunately, we can't wave any magic wands here, but we still have a few other tricks up our sleeve.

Having committed ourselves for AC type valves, we find that there are still plenty of suitable valves available through disposals for very low prices. For example, the 6AC7 costs only 2/6, so that a pair of these and a 6H6 makes possible a complete valve complement for 6/6! The 6SH7 (a little better for our purpose) varies from 5/6 down to 2/6, according to the quantity purchased. Either way, the total cost of valves should not present a problem.

The use of plug-in coils was another attempt to cut the costs. While not quite as convenient as a switched coil arrangement in some respects, it saves the cost of a switch as well as the space to house it. In addition, many beginners find the plug-in coils easier to work with, particularly when they wish to prune them or experiment with them in other ways.

As a natural follow-on to this idea, old valve bases may be used in place of formers for several of the coils, even though the specifications may need to be changed a little for the larger ones. We may have some more to say about this in a later article.

MANY TYPES

It isn't even necessary to use 6-pin types. Octals would be just as good, although harder to put in and take out, but really the only condition is that there are enough pins to make connections to all the coils.

The question of the dial gave us a good deal of thought. A good dial is essential in a set of this kind. Stations occupy such a little space, it is quite easy to pass right over the weaker ones unless a reasonable reduction ratio is used, while any backlash makes such stations extremely difficult to tune.

Commercial dials are available, which can be made to do the job, but they are comparatively expensive and call for considerable modifications. Old type friction type dials as used on early radio sets were very good, and it is worthwhile looking out for one of these. But if you are out of luck, the scheme we used should solve the problem reasonably cheaply, and quite efficiently.

This uses a planetary drive to provide the reduction between the knob and tuning, which lends itself quite nicely to the fitting of a simple home-made pointer and dial scale. Known as the Jabel No. 2 Planetary Drive, it is a good deal cheaper than a complete commercial dial.

Another problem concerns the tuned circuit and the coverage this has to provide. If we require the set for both broadcast and short-wave operation we are faced with the problem that a tuning capacitor large enough to cover the broadcast band in one sweep is really too large for the short-wave band. It tends to crowd these signals, making them harder to tune, although a good deal depends on the amount of drive reduction provided by the dial.

A more nearly ideal arrangement would call for a standard tuning capacitor (about 400 pf) for the broadcast band and something smaller for the short wave bands. Unfortunately, such dual purpose units are not available commercially so that, short of "doctoring" a standard 2-gang, to make one, we have to decide right at the beginning

PARTS LIST

1 chassis 8 x 5¼ x 1¾
1 Panel 9 x 6½
1 Planetary drive 5 to 1 reduction. Jabel No. 2 or similar
1 Power transformer, 150V, 30mA. 6.3V 2A.
3 Octal sockets
1 6 pin socket (or to suit coil formers).
2 6SH7 or 6AC7 valves
1 6H6 or 6H6GT valve
1¼ in. plug-in coil formers or valve bases, as required.
1 or 2 earphone jacks, as required.
2 terminals, red and black.
2 7 tag terminal strips
1 2 tag terminal strip
3 knobs

CAPACITORS

1 25 mfd 6V electrolytic
2 16 mfd 350V electrolytics
1 8 mfd 350V electrolytic
1 .1 mfd 200V paper
1 .1 mfd 100V paper
1 .022 mfd 200V paper
1 .0022 mfd 200V plastic or mica
2 .001 mfd 400V plastic or mica
1 400 pf (approx.) tuning capacitor, or as required
1 250 pf plastic or mica
2 100 pf mica
1 100 pf variable capacitor

RESISTORS

(All ½W unless specified)

1 .47M
1 .5M pot. with switch (Switch optional).
1 .22M
2 .1M
2 10K
1 6800 ohm 1W
1 4700 ohm
1 330 ohm
1 100 ohm tapped resistor (For filament circuit).

SUNDRIES

Winding wire for coils, hook-up wire, 18g tinned copper wire, power flex, nuts and bolts, solder, lugs, celluloid or perspex for dial pointer &c.

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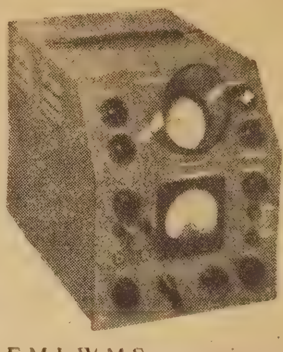

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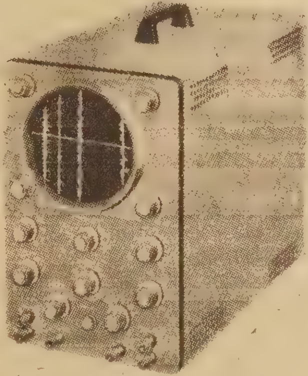

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which size we are going to use and accept whatever compromise this involves.

The position is further complicated by the fact that some users may require complete short-wave coverage, while others may be interested only in specific bands, such as the amateur bands.

It is well worth remembering that it is not difficult to remove some of the moving plates from the spindle thus reducing the gang size to almost any capacitance value. The rotor may be removed for this modification, and, after the bonding strip is cut throughout at the appropriate place, it is quite easy to pull out the unwanted plates. The result is a sturdy capacitor which can be mounted more firmly and easily than many midget types.

There are a number of tricks which may be employed to provide bandspread when committed for the larger capacitor, such as the use of series and parallel capacitors in individual coil formers, or the tapping of the tuning capacitor down the coil. However, these are not without their problems, and a separate article may well be justified to enlarge on this subject.

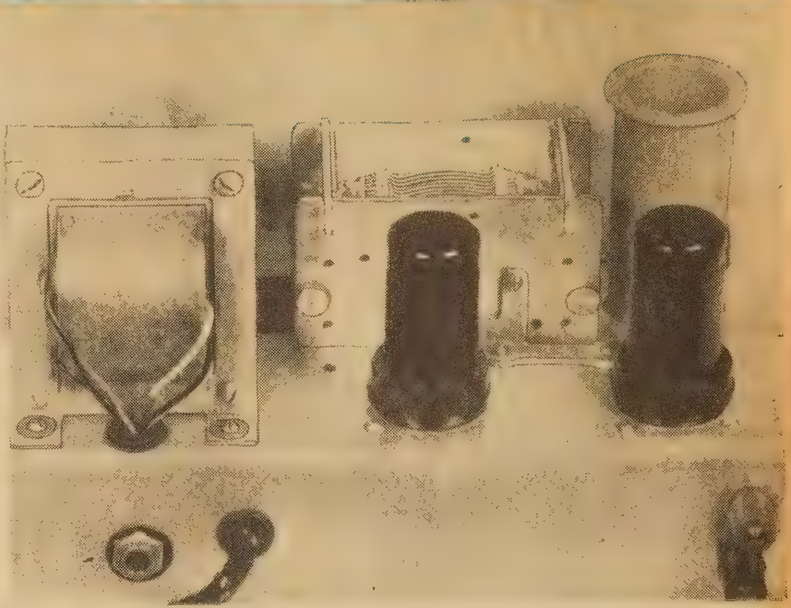
In the meantime, unless you have a smaller type readily to hand, we suggest you do as we have done; build the set around a standard broadcast gang. This will give complete coverage of the broadcast band on one coil, and complete coverage of the short-wave bands down to about 30 Mc on four coils.

OVERLAP

As can be seen from the coil data, there is a fair amount of overlap in most cases, so that the higher frequency end of each band will be the section most frequently used. Admittedly, full advantage is not taken of the 180 degrees of dial sweep, but the crowding is not serious with the reduction drive (5 to 1) which we used. Having achieved satisfactory operation on this basis, more elaborate systems may then be considered.

The type of gang used is not particularly critical, and we have allowed a fair amount of space so that the larger types may be accommodated. While the type we used is a reasonably modern one, there is no reason why an old-timer, salvaged from the junk box, may not be used. The main requirement is a maximum capacitance of about 400 pf and a sound mechanical movement. If it uses a $\frac{1}{4}$in shaft, an adaptor will be found in the planetary drive kit to convert to 3/8in for the latter.

REAR VIEW OF THE SET CHASSIS



This rear view shows just where the above-chassis components are mounted. If short waves only are required a smaller tuning capacitor will give greater bandspread, but will require more coils to cover the bands.

CONSTRUCTION

So much for the general design considerations. The next thing to consider is the actual construction. Our chassis was made from 16-gauge aluminium which is heavy enough to permit a simple front and rear fold without ends, and still remain quite rigid. This latter point is quite important in a set of this kind. The front panel also is of 16-gauge aluminium.

A commercially made steel chassis could be used, but steel is a good deal harder to work with if additions or alterations are contemplated. This applies particularly to the tuning capacitor. To preserve a reasonable panel layout, we mounted this upside down with a suitable cut-out in the chassis and the size and shape of this cut-out will have to be considered in the light of the capacitor it is proposed to use.

The steel of course will be more rigid than the aluminium, and if you are able to overcome the mechanical difficulties it is well worth considering.

In our case we had to drill four extra holes in the frame of the tuning capacitor to allow it to sit flush with the chassis in its inverted position. These holes may be tapped or simply used to accommodate standard 1/8in bolts and nuts. Take care when drilling the holes not to damage the gang plates.

A small cut-out also may be required to accommodate the planetary drive, and the position of this may need to be adjusted according to the capacitor used. The brass arm from this drive is secured to the front of the chassis near the bottom by means of a countersunk screw, to avoid fouling the front panel.

CURSOR COLLAR

Attached to the front of the planetary drive is a small collar fitted with three countersunk screws. The latter are to secure the dial pointer or "cursor," and this may take several forms. The simplest would be a length of stiff wire, painted black, and soldered to a disc of metal which would then screw to the collar.

Another approach, and the one we used, is to shape a cursor from celluloic or perspex and mount it directly on the collar. Some workers prefer the "off set" type cursor. i.e., one which ha been halved along the calibration line so that dial markings may be made without shifting the cursor setting.

COIL DATA

All coils are wound on $1\frac{1}{4}$ diameter plug-in formers or valve bases. Though actual gauges are quoted, some latitude is possible particularly on the shortwave coils, where space is not so critical. All windings are wound in the same direction.

BROADCAST BAND

Grid winding: 100 turns 29 B & S close wound. Primary: 15 turns of 29 B & S, spaced $\frac{1}{8}$ in from earthed end of grid winding. Reaction: 40 turns 36 B & S spaced $\frac{1}{8}$ in from grid end.

BAND TWO (1.2 to 4.4 Mc)

Grid winding: 38 turns of 24 B & S enamel, close wound. Primary: 11 turns of 29 B & S enamel spaced $\frac{1}{8}$in from earthed end. Reaction: 27 turns of 29 B & S enamel spaced $\frac{1}{8}$ in from grid end.

BAND THREE (2.35 to 8.7 Mc)

Grid winding: 16 turns of 24 B & S enamel, spaced to occupy $\frac{1}{2}$in. Primary: 7 turns of 29 B & S enamel spaced $\frac{1}{8}$ in from earthed end. Reaction: 8 turns of 29 B & S enamel spaced $\frac{1}{8}$ in from grid end.

BAND FOUR (4.6 to 17.6 Mc)

Grid winding: 8 turns of 24 B & S enamel, spaced to occupy $\frac{1}{2}$ in. Primary: 2 turns of 29 B & S enamel spaced $\frac{1}{2}$in from earthed end. Reaction: 3 turns of 29 B & S enamel spaced $\frac{1}{8}$ in from grid end.

BAND FIVE (9 to 32 Mc)

Grid winding: $3\frac{1}{2}$ turns of 18 B & S (approx.) enamel, spaced to occupy $\frac{3}{8}$ in Primary: 2 turns of 29 B & S enamel spaced $\frac{1}{8}$ in from earthed end. Reaction: 2 turns of 29 B & S gauge spaced $\frac{1}{8}$ in from arid end.

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5-4C	£1/17/6	10-3G	£2/15/-
5-4F	£2/8/-	12K	£3/6/-
5C	£1/13/6	ETM	£4/1/-
5F	£2/2/6	12Mx	£6/16/6
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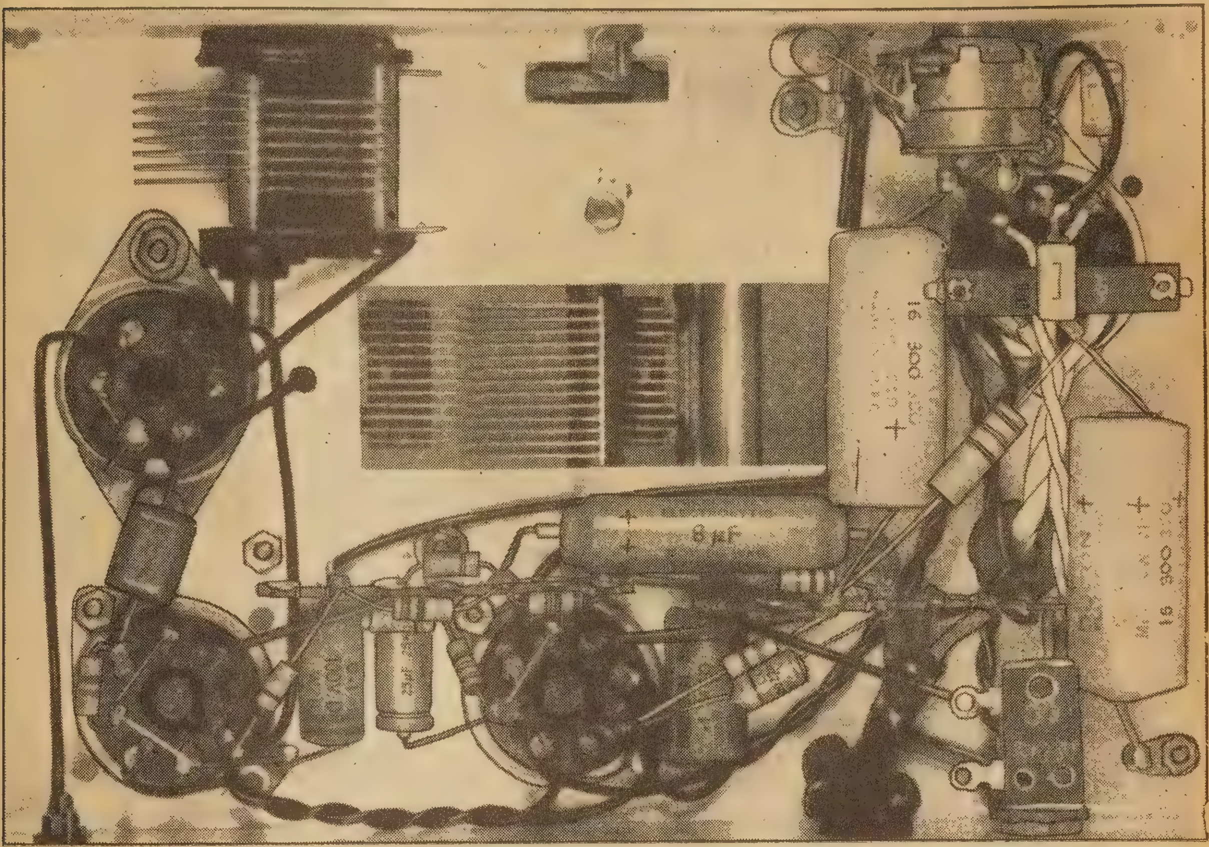


This photograph is really better than a wiring diagram and nearly all the components may be clearly seen.

A good idea of the general layout can be obtained from the chassis photographs, and these should be studied in conjunction with the circuit. If you would like a better chassis picture, original glossy prints may be purchased through our postal service priced at 5/ for each 8in x 6in print.

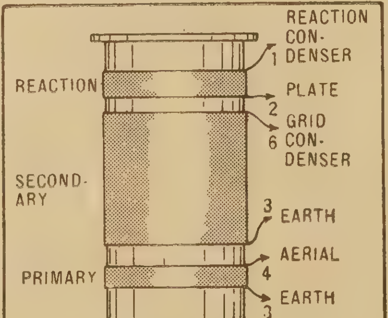
In mounting the major components, make sure that the detector and audio sockets are correctly orientated, with the keyways towards the rear of the chassis, but also slightly towards the transformer end. The 6H6 keyway faces directly to the rear.

LEAD LENGTH

Before mounting the power transformer make sure all relevant leads will reach to the 6H6 socket and reverse the mounting if necessary. A seven tag terminal strip is mounted by one of the transformer mounting bolts, and the half nearest the end of the chassis is used to terminate the incoming power cable (including the earth wire to the centre tag), and the leads from the switch on the volume control. (This switch is not essential, and may be omitted if a usable pot. already is on hand.)

The 6.3 volt leads run direct to the 6H6 filament pins, and a twisted pair run from here to the remaining two valves. The twisted pair is preferable to a single wire with chassis, since there is a risk of hum with the latter arrangement.

In fact, we found it very desirable to fit an adjustable tapped resistor across the filament network (the 6H6 filament terminals) so that an exact electrical centre tap may be selected. This is most beneficial in removing the last trace of hum, particularly in the case of the 6AC7's (more prone to this trouble by reason of their high gain) or where a high value of grid leak appears to be desirable for other reasons.



This diagram shows the order in which the connections are made to the coils, all windings being in the same direction. The numbers correspond with the pin numbers you could conveniently adopt if using 6-pin plug-in formers.

The hum can be particularly annoying when the set is oscillating or near to oscillation, when its sensitivity is extremely high.

The resistor we used is a recently released unit, made in strip form, with a sliding contact. The value is not critical but 100 ohms is a common one and quite effective. It is adjusted by simply setting the sliding contact for minimum hum.

Before much wiring is done, make sure that pin 1 on the detector and output valves is connected to chassis. A solder lug under the socket bolt will help in this regard. If a steel chassis is used it will be unwise to trust the chassis itself for "earth" connections and these should be linked by a run of bare tinned copper wire, say 18 gauge.

DETECTOR

In the case of the detector socket, pins 3 and 5 also need to be earthed, and the pin 1 connection should be extended to take in these as well. Similarly, the 6H6 cathode pins (4 and 8) should be bridged to form a common cathode, and pins 3 and 5 of the output valve linked.

The remaining half of the tag strip provides a main HT terminal, and a sup-

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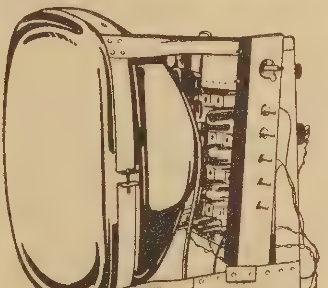

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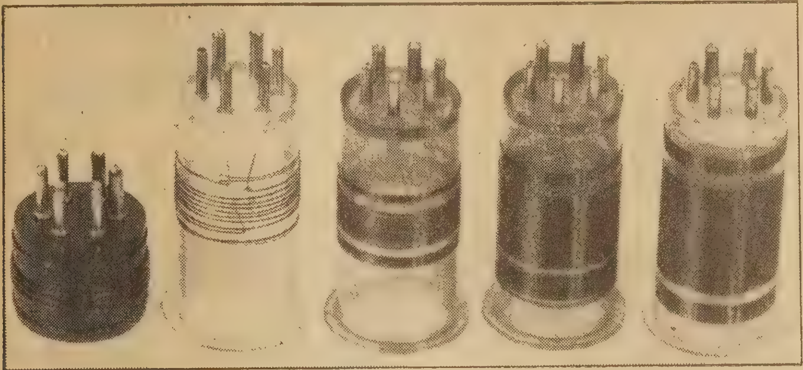
port for the .1 mfd output coupling capacitor, while a second seven tag strip, mounted near the output valve socket, supports the decoupling, plate, and screen resistors, plate and screen by-passes etc., for the detector valve. A two-tag strip near the volume control supports one end of the coupling capacitor to the output stage.

The wiring associated with the tuned circuits should be kept as rigid as possible, and tinned copper wire in insulated sleeving is better than hookup wire for this job.

Otherwise, there is very little to the wiring likely to cause anyone, even a beginner, any serious problems. Thus we may turn to the operation and adjustment of the set after one or more coils have been wound.



Here are five coils of the type used in this receiver. The two largest coils require full sized formers, but the others could be wound on discarded valve bases.

The first point to check with any regenerative set is that it does, in fact, "regenerate." That is, the set may be made to oscillate when the regeneration control (the 100 pf variable capacitor) is brought towards full mesh. This will be indicated by a rushing sound if no station is present, or a whistle if there is one.

(It is surprising the number of beginners who fail to appreciate this point. When they write to us for help with such sets they seldom volunteer any information concerning the success or otherwise of this vital section of the circuit.)

The set cannot be used while it is oscillating (except in the case of Morse code signals) and the regeneration must be reduced to a point just below the oscillating condition. At this point we achieve both maximum gain and maximum selectivity.

AERIAL RESONANCE

If the set seems to regenerate normally except for a small section of one band it is probable that the aerial is resonant at this frequency, causing increased loading. Inserting some series capacitance in the aerial lead will overcome the problem, either by reducing the coupling to the aerial or altering the resonant frequency. Make the capacitance as large as possible consistent with reliable regeneration.

The second point to check is that the set goes in and out of oscillation smoothly, since this allows us to work as close as possible to the oscillation point without actually spilling over. A set should "slide" into oscillation, never "plop" in. Even worse is the condition where it goes in and out at different settings of the control.

The regular volume control allows us to operate the regeneration control at maximum setting, for maximum selectivity, at all times, even with very loud signals. It is a mistake to reduce volume by backing off the regeneration.

In general, fierce oscillation means that there is too much coupling between the feedback winding and the grid, or that the overall gain of the valve is too high. Particularly if the control needs to be opened almost right out we need to reduce the feedback energy.

The 100 pf capacitor marked with an asterisk is one means of controlling this. The larger it is the less feedback energy reaches the coil, and there is plenty of room for experiment here.

Increasing the spacing between the feedback and grid winding will have a similar effect, while various values of grid leak may also help to smooth this out a little. Shown as .47M it may be increased up to 4.7M, but may cause other undesirable effects, such as "squegging" in some cases. Once again there is plenty of room for experiment.

It may even be worth while experimenting with the detector screen voltage to improve regeneration control, but remember that reduced screen voltages mean reduced gain, so that this approach has its limitations.

VITAL POINT

The important point to appreciate is that it is worth while taking some trouble to ensure correct regeneration, since the whole success of the set depends on this. In the event that difficulty is experiencd in obtaining this over the whole of any one band priority should be given to the high frequency end rather than the low end which overlaps the next band.

Space does not permit us to say much about the coil winding procedure, but the data given should provide all the information. However, the gauges of wire are not particularly critical and a few gauges either way will make little difference. It might be wise to use coil formers with not less than six pins, even though only five are used. An additional pin may be handy if bandspread coils are contemplated.

This should cover most of the points involved in building and operating the set, and we suggest you collect the necessary bits and pieces and go to it. If you have never built a set before, or a set of this type, you are due for some exciting listening.

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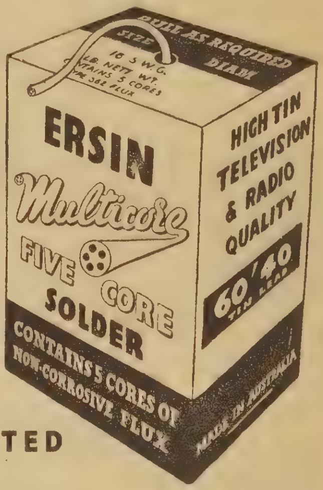
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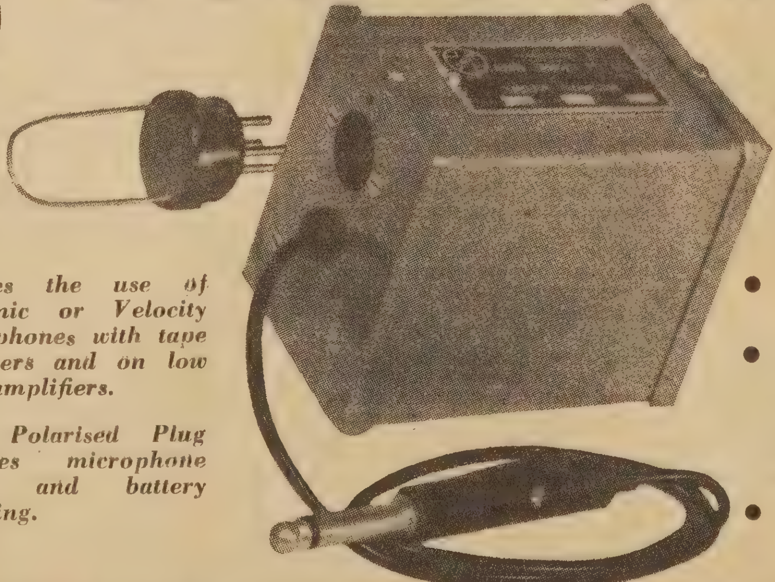

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FROM THE SERVICEMAN WHO TELLS

By what standards do you judge the performance of a TV set? Whether it be a new one or one on the service bench, do you check it according to a set routine, or does it get little more than a quick "once-over"? A TV set is such a complex instrument that it is easy to overlook small but important details and this month's article discusses the major points which should be checked.

A SITUATION which most servicemen encounter from time to time (I'm sure many of my readers will recognise it) is one where, while off duty, trying to relax, and usually in someone else's home, one is buttonholed by one's host, or fellow guest, with the well-known phrase, "So you're in the radio game, eh? Well now, I've got a problem; I wonder if you . . . etc."

I am not now referring to the type of person who wants some free advice so that he can do a repair job on the cheap, but rather to the person who has a genuine problem and is anxious to talk to someone who will give an unbiased opinion. These days, it invariably concerns TV sets.

Very often the owner imagines his set has developed a fault but feels he would like some confirmation before calling his local serviceman. In fact, the gist of many problems is, "Should I call my serviceman? Is it reasonable to ask that this effect can be corrected?" In most cases one can set their minds at rest with no more than a quick look at the set and a few words of advice.

However, a more difficult situation concerns the all important matter of purchasing the first TV set, and I seem to have the unhappy knack of finding myself in homes where a new set has just been installed. And always just about the time when the first flush of enthusiasm has worn off and the fellow is worrying whether the set really is as good as it should be, and should he sign on the dotted line.

So I am pounced upon and dragged off to the lounge-room to view the set and give my opinion.

Is it ethical? Well, I don't know, but what would you do? Be churlish and refuse point blank? Be non-committal and be thought too stingy—or worse—too ignorant to offer some elementary help? Or do your best to help within reasonable limits, provided this does not cut across the interests of the dealer involved?

Frankly, I find the last arrangement the easiest.

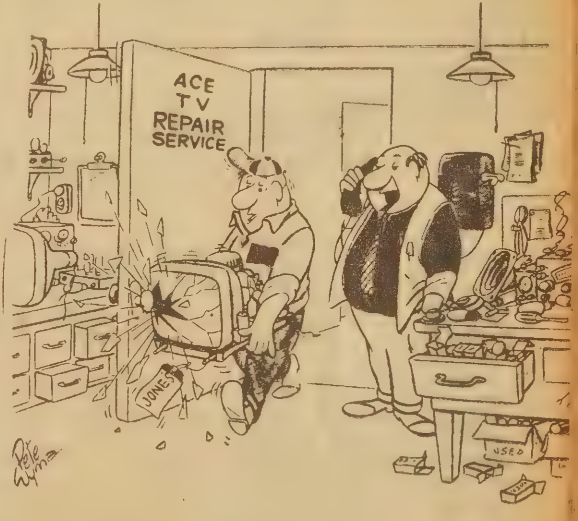
The whole point of the matter is that very few prospective purchasers have a clue about what to expect from a set. They have no idea how good the picture should be or the extent to which it will vary with program material. No idea how much attention the set will need in the way of fine tuning, contrast, and brightness adjustments for each channel, what constitutes reasonable standards of picture stability or a host of other points.

Of course, the salesman should cope with all these problems, but many of them are less than adequate and are always suspect anyway—at least as far as the customer is concerned—because they have an axe to grind.

So he — the customer — grasps any opportunity to get an independent and unbiased opinion; meaning that you or I become the unfortunate "bunny." I say "unfortunate" because, no matter how much one wants to help, it is very unwise to become too deeply involved in such matters. On the one hand, there is the dealer to consider and the fact that it is unwise to cut too sharply across his interests. And, on the other, the risk that you may advise a customer to buy a set which turns out to be less reliable than average.

For this reason, one should avoid branding any set simply as "good" or "bad," or advising anyone outright to accept or reject a set. About the most you should do is to play the role of a keen observer, pointing out any aspects of the set's performance which are below acceptable standards, or clear up any points about which the customer may be in doubt. Then the customer is left to make up his own mind. Provided this approach is made clear from the start, no one is likely to be embarrassed.

(If in the process, the customer can be given some idea of how to check a set himself, then so much the better. He will then be able to make any future decisions unaided, and on a more realistic basis.)



"We're testing it now, Mr Jones, and it looks like you need a new picture tube."
—Radio-Electronics

And just how should one go about the purely technical job of assessing the performance of a TV receiver? It seems like a formidable task at first glance; and it can be unless it is tackled systematically. For this reason I have prepared a list of the major points which should be checked. I hope it may prove helpful.

However, a list can only serve as a reminder of what to check. The decision as to what is good or bad rests with the individual, based on his own experience And, of course, one's standards must be related to everyday practice and tempered with commonsense, otherwise any set may be rejected as less than "perfect."

FINE TUNING: In a surprising number of cases I have struck, no attemp has been made to set the individual coil so that it is possible to tune all thre channels correctly. As a result, one o more channels may suffer and the customers may reject the set on this poin alone.

Ideally, the set should not only b capable of tuning all three channels correctly, it should do this with reasonable accuracy for one setting of th fine tuning control. The truth is tha very few users ever grasp the idea o using this control correctly, or bothe to adjust it from channel to channel so that any one channel which require a major adjustment, will consistently b found giving a very poor picture.

HOLD CONTROLS: The horizonta and vertical hold controls seldom cau much trouble in a new set, but it is well to check that they are correct set. The main test is to note wheth there is any sign of slip when changi from channel to channel, particularly the horizontal circuit. If there is, t appropriate control should be adjust until a stable condition is produced.

The vertical circuit should be si larly adjusted, but I have found so

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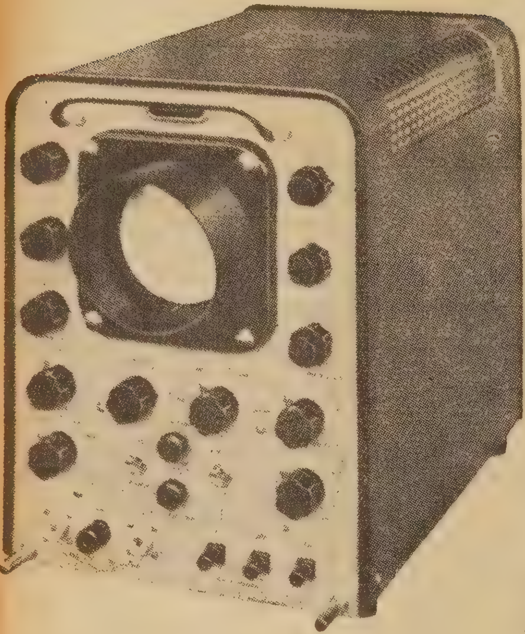

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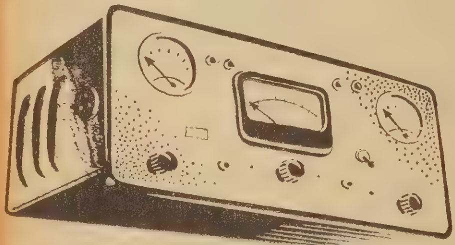
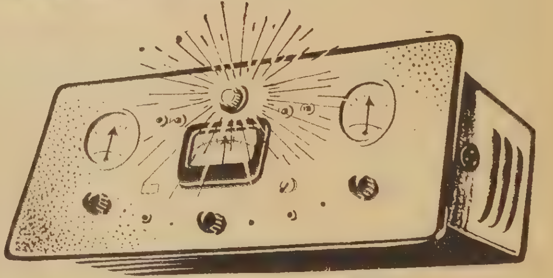
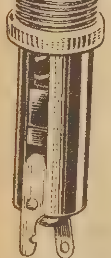


IS IT WORKING?



HERE'S A QUESTION EASILY ANSWERED WITH A . . .



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sets in which a tendency to slip frame seems to be an inherent characteristic, even though the system seems perfectly stable once it locks. Some tolerance may have to be exercised here.

OTHER CONTROLS: Contrast, brightness, volume, tone, on-off switch, etc., may appear obvious, but they should be checked. In particular, lack of adequate contrast may indicate a circuit or aerial fault which otherwise may be overlooked.

SOUND: Another item which is often taken for granted. While most audio systems are standard single-ended affairs, it is reasonable to expect something better than from the average broadcast receiver, assuming reasonable program material. Where a set is fitted with a side mounting speaker it is worthwhile pointing out that this must cause some degradation of the sound. However, leave it to the customer to make any decision.

Check for frame buzz, particularly where a high contrast picture with large white areas is encountered. However, be reasonable in this respect, since some frame buzz is almost always faintly audible when close up to the speaker. However, it should be inaudible at a distance of a few feet with a normal volume setting.

Most of the foregoing tests can be made at any time that average programs are being transmitted, while those which are to follow are best made when test patterns are available. The latter are not absolutely essential, but they do make the job a good deal easier, and advantage should be taken of them if at all possible.

PINCUSHION OR BARREL DISTORTION: This takes the form of curvature of vertical and horizontal lines near the edge of the screen, the centre of the line being bowed outwards (barrel distortion) or inwards (pincushion distortion). This normally is a function of the yoke design, and little can be done apart from changing the yoke. However, a few designs use small correction magnets, and it would be up to the dealer to have these adjusted correctly. Most test patterns have groups of horizontal and vertical lines to assist this check.

In making this test, view the picture from directly in front. Due to the curved face of the tube some barrel distortion is inevitable on one side of the picture when the viewer is to one side. There is little that can be done about this.

ASPECT RATIO: Circles on a test pattern should appear as circles, not ovals. However, some discretion mav be necessary here, as not all test patterns are above reproach in this respect. Only experience will tell you which ones to depend on, but, where two channels agree, it would be reasonable to suspect the odd one which differs, at least on a practical basis. The height and width controls are used to adjust this characteristic.

LINEARITY: This factor is so closely related to height and width that it is difficult to consider them separately. Assuming correct height and width, a distorted circle suggests non-linearity, particularly if it is flattened or elongated on one side. While it might be permissible to make minor adjustments to the height and width controls to correct minor faults, it would be unwise to become too involved with the linearity controls, otherwise you may finish up with a major adjustment job on your hands—just when the test pattern goes off the air!

However, the customer may be advised whether it would be reasonable to expect such faults to be corrected on request, assuming that no other faults are apparent and he likes the set in all other respects.

CENTRING: Pictures often are slightly off centre and, although not a serious fault, it should be at least mentioned. Then, if you do not care to make the adjustment yourself, the customer can be advised that it would be reasonable to ask for this to be done.

PICTURE DEFINITION: This, and other factors directly affecting the picture quality, are most important for, after all, "the picture is the thing." It is therefore worth taking some care in checking them.

Using the popular Marconi test pattern, with a vertical wedge of lines at the top, it would seem that typical commercial receivers should resolve between 350 and 400 vertical lines.

Not many reach the latter figure, and it would seem that some channels transmit a better picture anyway, but most will reach 380 to 390 lines. Naturally the fine tuning control must be set for the best picture, but avoid overtuning as indicated by loss of solid blacks, sound bars, and 5.5 Mc herringbone.

It would seem reasonable to accept anything above 350 lines, to treat anything between 300 and 350 as highly suspect, and anything less than 300 as unacceptable.

The picture also should be examined carefully for signs of video ringing, something which calls for a certain amount of experience. This takes the form of repeat images following a sharp black-white or black-grey demarkation; i.e., white following black, followed by black again and, in bad cases, repeated several times.

Some discretion must be exercised here, since a certain amount of "over shoot" — white following black — is usually unavoidable and generally acceptable. However, there should be no sign of a repeat black image.

Take care that this condition is not confused with ghosting, particularly the ghosting caused by relatively close reflectors and which may be easily mistaken for ringing.

INTERLACE: This also calls for some practice, but is not really difficult. A picture completely devoid of interlace (rather unlikely in a commercial set) appears to have a perfectly rigid and stationary line structure — as if the lines had been drawn with a ruler — while the spacing between them is excessive.

In the case of perfect interlace (also rather rare) the line structure is much finer and perfectly evenly spaced. It also has a "lively" appearance about it which is unmistakable. Even when the interlace is less than perfect this "liveliness" is evident and can be emphasised by running the tip of the finger slowly up or down the safety glass and allowing the eye to follow it. The line structure will then appear to move up or down with it.

Even when a set is interlacing perfectly, it may be difficult to see the finer line structure when the screen is viewed close up. This is due to the strobing effec
whereby the eye tends to superimpos
the two adjacent lines. A little practic
is required to overcome this effect.
technique of staring fixedly at one sp
on the screen, together with a fair
critical brightness adjustment will hel
considerably.

Some "pairing" — grouping of tw
lines close together to form a pair
probably will occur in most cases, b
it should not be so bad that the tw
lines merge to form one wide line.
fact something a good deal better tha
this now appears to be achieved by mo
manufacturers.

The setting of the vertical hold contr
may have some effect on interlace an
provided the stability of the frame ci
cuit is not prejudiced, it may help
re-set this slightly while observing t
interlace.

FOCUS: This is not a serious proble
with most modern sets, since the electr
static system now almost universal
adopted is not particularly critical. Ho
ever, a few electromagnetic syster
have been employed until quite recent
and some new sets may be found wi
this system.

It often is difficult to secure ev
focus over the whole tube face, mea
ing that some compromise setting
necessary, while sets sometimes arri
in a customer's home with the setti
jolted out of place in transit. Ma
sure that this is correctly set or capal
of being set, otherwise picture definiti
will suffer.

PULLING. Most test patterns have
checker board pattern around the ed
to show up any tendency for video
formation to penetrate the synch sep
ator and produce horizontal displa
ment of vertical lines, varying with p
ture content. A good set should p
any test pattern without any sign of t
trouble. However, remember that
test pattern represents an extreme c
dition and the effect will be less obvi
on program material.

HERRINGBONE ON CHANNEL
This was discussed in these columns
cently (May, 1959) and there is no po
in repeating the details. However,
point should be checked and the eff
pointed out if present. Whether a
should be condemned outright for s
a condition is debatable, since so m
may depend on locality, installation,
However, it should not be tolerated

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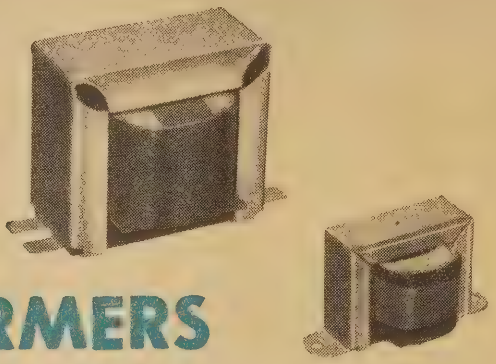

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Transportagram Six—R.T. & H. October, 1958	TRD108	TRS109
Transporta Seven—R.T. & H. February, 1959	TRD108	TRS109
Three Transistor Mantel—R.T. & H. March, 1959	Not Used	TRS109
RCS 6 Transistor Portable Receiver	TRD108	TRS109
RCS 7 Transistor Portable Receiver	TRD108	TRS109
RCS Transistor Portables—RCA Transistors	TRD107	TRS108
500 mW Amp. } Philips Miniwatt Journal Vol. 1, No. 2	TRD108	TRS107
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the customer has a right to demand that it be cured before the set is accepted.

FLICKER: This is something which worries a lot of people unnecessarily. Being unaware that flicker is fixed quantity for all sets and merely a factor of brightness adjustment, picture content and, possibly, viewing conditions, they are likely to condemn a set quite unfairly.

I have known prospective purchasers to walk through a showroom, pick out the sets which appeared to flicker (because they were running too bright) and promptly condemn all those makes as unsatisfactory. The next day, of course, they could make the same test and get a completely different answer.

The only thing you can do here is to correct their ideas on the subject so that they may be free to select a set without worrying over this problem.

GHOSTS: These, of course, are essentially a function of the aerial and it is desirable to correct any ideas the customer may have that this involves the set. If the aerial is a temporary installation, this fact must be remembered in assessing the set's performance in respect of ghosts, noise, etc., and which are functions of the aerial.

In the matter of noise, it should be realised that quite bad noise sometimes is encountered from stations which are quite strong, due to the poor characteristics of certain cameras or camera chains. In general, however, noise should not be a problem in ordinary suburban areas, and any set which suffers from it should be highly suspect, either in itself or in regard to the aerial.

Finally, having checked all these points individually, the picture should be viewed as a whole at something like normal viewing distance and its general quality assessed in the light of one's own viewing experience.

After which, you should be able to deliver a reasonably accurate report on the set's performance, mainly in the form of a list of whatever defects have been found, together with some idea of their importance. The final decision may then be left to the customer.

All this may sound like a lot of work for what is, in some cases, nothing more than a courtesy job, but it should be realised that many of the tests may be made in less time than they take to describe, the main thing being to ensure that they are made. In fact, working according to a set pattern will enable a first-class job to be done in a very short time and is far more satisfactory than a haphazard, it-looks-all-right approach.

For my less experienced readers, particularly interstate, practice in assessing the quality of a set will be well worthwhile acquiring, whether they be interested in sales, service, installation, or just a hobby.

As a natural follow-up to the foregoing points I feel bound to make some comments, arising out of my own experiences, concerning the manner in which many sets are presented to a prospective customer. While I have no doubt that many salesmen do a worthwhile job, a good many others seem quite unable to appreciate the most elementary principles of salesmanship. Many a set is sold in spite of, rather than because of, their activities.

Very often a set is virtually "dumped" in the customer's lounge-room, a temporary aerial lashed to the nearest fence post (regardless of any problems of local terrain), the set switched on, and the salesman is on his way in 10 minutes flat!

No attempt is made to check the set's performance (apart from establishing that something moves on the screen) or to explain anything about the set's controls beyond, perhaps, a brief, "This is the contrast, this is the volume, this is the brightness, etc.," without a hint of what these are supposed to do or how they should be used.

One case I encountered recently is typical. Two sets had been left for trial and the first questionable point was that both had been connected to the same aerial. Admittedly, the salesman had advised against using both sets at the same time, but there were still many strange effects when the inactive set was set to various channels. This so confused the whole set-up that the first thing I did was separate the sets and show the customer how the aerial could be changed over as required.

Then I set to and examined each set. Set No. 1 was a well-known brand which I fully expected to give its usual faultless performance. Instead it turned on a shocking display. The picture tube apparently was not an original type, since it had a marked brown tint which was quite foreign to this make. While one might argue about the aesthetics of such a tube, it did suggest that a certain amount of fiddling had been indulged in.

This seemed to be confirmed by the performance of the remainder of the set. The definition was extremely poor (it didn't need a test pattern to reveal that) and suffered from severe signal ringing. I gained the impression that the IF strip was badly in need of alignment.

The fine tuning control was able to tune all channels correctly, but needed nearly all its range to do so. Since it used an incremental tuner I wasn't prepared to buy into that problem.

Turning to set No. 2 I found it to be a very much cheaper model of rather obscure make. It could tune channels 7 and 9 all right, but wouldn't tune within coo-ee of channel 2. As a result, the latter was hard put to it to resolve 200 lines — and it looked like it.

Since it was a turret tuner I had no hesitation in removing the tuning and selector knobs and attacking the channel 2 core. Using a screwdriver hastily fashioned from a scrap of discarded knitting needle it took only a few seconds to adjust things so that channel 2 was "spot on" with the tuning control in its mid position. Then I trimmed 7 and 9 so that they peaked in the same position.

(Perhaps this is unethical or something, but I have no compunction about doing it if I think it will help somebody make a wise choice. As far as that goes, I might even have done a salesman a good turn now and again, even if he didn't deserve it.)

This set had a better definition than set No. 1, but suffered from loss of solid blacks, a condition once again suggestive of IF alignment trouble.

Finally I had to point out that it suffered from serious barrel distortion, a condition which the customer had noticed himself and which he had intended to question had I not mentioned it. When I told him that this would be almost impossible to fix, he immediately "wiped" all ideas about buying the set.

Since he wasn't very happy with my

(Continued on Page 127)

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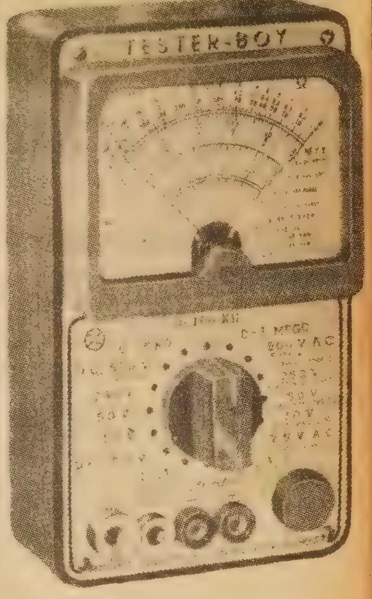

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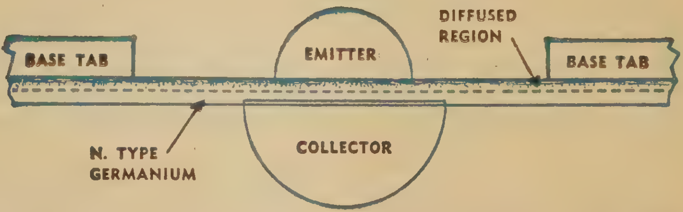
BOUT THE NAME DRIFT

he word DRIFT is a well-known term in physics used to describe the motion of charged particles in ionized gases under e influence of an impressed electric field. Charged particles move much faster in a given direction by "drifting" in an ectric field than they can by random diffusion in the absence of an electric field. In keeping with the analogy between e drift phenomena in gaseous discharges and in semiconductors, the word *'Drift'* is applied to transistors which corporate a "built-in" accelerating field.

he electric field in drift transistors, which literally propels the charge carriers from emitter to the collector, is achieved y the graded distribution of an impurity in the germanium base region. This "built-in" accelerating field, a feature not vailable in conventional transistor designs, results in greatly decreased transit time and therefore a much higher upper equency limit.

Cross-sectional view of the drift-transistor structure.



IE DRIFT PRINCIPLE

e successful use of the drift field principle lies in the critically accurate control of impurity distribution in the base gion during manufacture. The density of the impurity distribution in the base decreases exponentially from very high ues at the emitter to low values at the collector. The impurity distribution introduces a constant electric drift field ich accelerates (propels) the charge carriers through the base region. Compared with the performance of conventnal transistors, in which the charge carriers move by means of diffusion—a comparatively slow process because of its dom nature — the acceleration of charge carriers by the drift field represents a major improvement. Because of the celerating field in drift transistors, the transit time of the charge carriers is substantially less than the transit time the carriers in a conventional transistor. This results in greatly increased high frequency performance.

RIFT" TRANSISTORS PROVIDE SUPERIOR PERFORMANCE

e high impurity density in the base near the emitter results in a *low base resistance,* while the low impurity density r the collector contributes to *low collector capacitance* and results in a high collector breakdown voltage. The remely low value collector capacitance makes neutralization unnecessary in most applications and permits the design simple and economical circuits.

IELDING MINIMIZES INTERLEAD CAPACITANCE

combination of low base resistance, high collector breakdown voltage, low collector capacitances, and short transit e, makes possible the design of high-power gain, high-frequency circuits with excellent operating stability and good omatic-gain control capabilities over a wide range of input signal levels.

drift transistors described here have four flexible leads and are hermetically sealed in metal cases. The fourth l is connected to the case internally to minimize interlead capacitance and reduce coupling to adjacent circuit nponents. These important design features contribute to the usefulness of drift transistors in high-frequency circuits, icularly in those industrial and commercial applications where low feedback capacitance is an important design sideration.

DRIFT TRANSISTOR DATA CHART

TYPE	CLASS OF SERVICE	MAXIMUM OSCILLATOR FREQUENCY	TYPE	CLASS OF SERVICE	MAXIMUM OSCILLATO FREQUENC
2N247	RF Amplifier	132 Mc.	2N544	RF Amplifier	132 Mc
2N274	RF Amplifier	132 Mc.	2N640	Automobile RF Amplifier	132 Mc
2N370	RF Amplifier	132 Mc.	2N641	Automobile IF Amplifier	132 Mc
2N371	RF Oscillator	132 Mc.	2N642	Automobile Converter	132 Mc
2N372	RF Mixer	132 Mc.	2N643	High Speed Switch 20 Mc.	—
2N373	IF Amplifier	132 Mc.	2N644	High Speed Switch 40 Mc.	—
2N374	Converter	132 Mc.	2N645	High Speed Switch 60 Mc.	—
2N384	VHF Amplifier	250 Mc.			

FEATURES OF DRIFT TRANSISTORS IN HIGH-FREQUENCY APPLICATIONS

- low base resistance
- high output resistance for increased gain
- low feedback capacitance
- high alpha-cutoff frequency
- controlled input and output characteristics
- controlled power gain characteristics to insure unit-to-unit interchangeability
- rugged mechanical construction
- excellent stability
- exceptional uniformity of characteristics

DESIGN BENEFITS INCLUDE:

- high input-circuit efficiency
- excellent high-frequency operating stability
- good signal-to-noise ratio
- good automatic-gain-control capabilities over a wide range of input-signal levels

These drift transistors *are germanium p-n-p alloy-junction types which are specifically designed and controlled operation in mass-produced electronic equipment operating at frequencies up into the vhf band.*

2N247 **2N373** **2N641**
2N370 **2N374** **2N642** **2N645**
2N371 **2N544** **2N643**
2N372 **2N640** **2N644**

2N274

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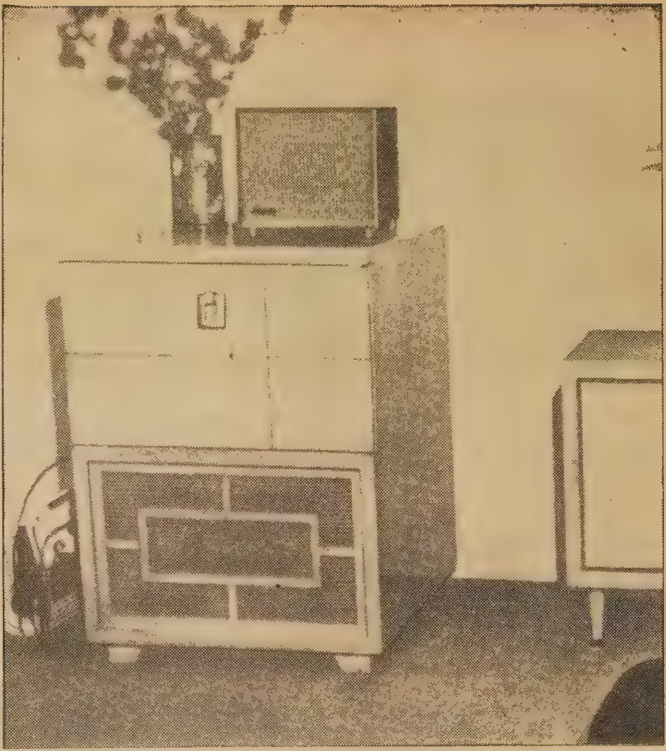


What to do about
STEREO SPEAKERS

By Donald C. Hoefler

Is there an inexpensive short cut when converting to stereo? Our contributor puts forward what he calls a commonsense look at the facts as he sees them, and says no!

FOR the audiophile who has a considerable investment in a monophonic system, the problem of adding a second hannel for stereo becomes acute when the cost of a duplicate peaker is considered. Remembering that the price of his resent speaker represents the biggest single item in his monohonic system, many a hi-fi fan has rebelled at the thought of ying out that kind of money again.

Realising that this reaction could be a stumbling block in ublic acceptance of stereo, imaginative speaker manufacturers ave proposed inexpensive short cuts in stereo loudspeakers. Whether or not all of their claims will stand up under close rutiny will be examined later in this article. At any rate, the ospective buyer should know the several courses of action pen to him before he takes the road to stereo.

USING A SINGLE WOOFER

The short cuts, reduced to their simplest terms, involve e use of only a single woofer. Since this unit is the only ne which absolutely requires an acoustically correct enclosure, you can avoid duplicating the woofer the saving in speaker nd cabinet cost can be considerable.

The justification for this approach is some disclosures made many years ago by several Bell Telephone Laboratories ngineers. These men are Harvey Fletcher, J. C. Steinberg and B. Snow. The gist of their revelations is that, at the long dio wavelengths (frequencies from about 300 cps on down), ere is no appreciable difference in the phase of loudness of ch sounds reaching the two ears. In short, the hearing system essentially non-directional in the bass region.

If this be true, then it is argued that there is no particular vantage in extending the two-channel system to cover the gion below 300 cps. One woofer system should be enough, ith only the mid-range and treble speakers requiring duplican, for it is in these areas that all of the stereo effect lies.

This argument is the basis of the Stereon concept, championed by Electro-Voice. Since few if any recordings channel of the bass to one side only, however, it is necessary to mbine the bass from both tracks in the reproducing system, d direct it to the single woofer. In the Stereon system, a "control filter" is inserted between the amplifier channels and the speakers for this purpose.

This filter is essentially a combining network for the two bass signals, plus a crossover network for the added treble speaker. It distributes all of the bass, plus the treble from one channel, into the large full-range speaker. All signals above 300 cps from the other channel are directed to the treble-only speaker.

It is up to the listener to decide at which side the full-range speaker shall go. It is also possible to place the big speaker in the centre, with two treble outriggers, one at either side.

University has a similar adapter network for use with existing speakers, but for another approach at the same result they offer their dual voice coil woofer. As its name implies, this is a single bass speaker, with two voice coils on a common suspension. In this case one coil receives all of the bass from the left channel, while the other coil gets all of the bass from the right. Then both of these signals are combined right in the speaker, acting together to move the single speaker cone.

Finally, two or more treble speakers are added for the stereo channels. This system avoids the expense of the adapter network or control filter, but requires the purchase of the special woofer. Thus it has no particular advantage for one who already has a good full-range speaker.

TREBLE MOST IMPORTANT

The Jensen approach to stereo speakers goes along with the idea of limited directivity of the bass spectrum, but not to the extent of eliminating one bass speaker. Their position is that the location and angle of each bass speaker is not very critical, but that these factors are of utmost importance in the treble region.

The Stereo Director by Jensen is a two-way (mid-range and tweeter) speaker with a turntable mounting, permitting it to be rotated independently of the woofer cabinet. It may be located behind a grille and on a shelf within the cabinet, or even placed outside if desired. In either case, the two woofer cabinets may be placed flush against the wall, while the treble units may be rotated to any focal point as required.

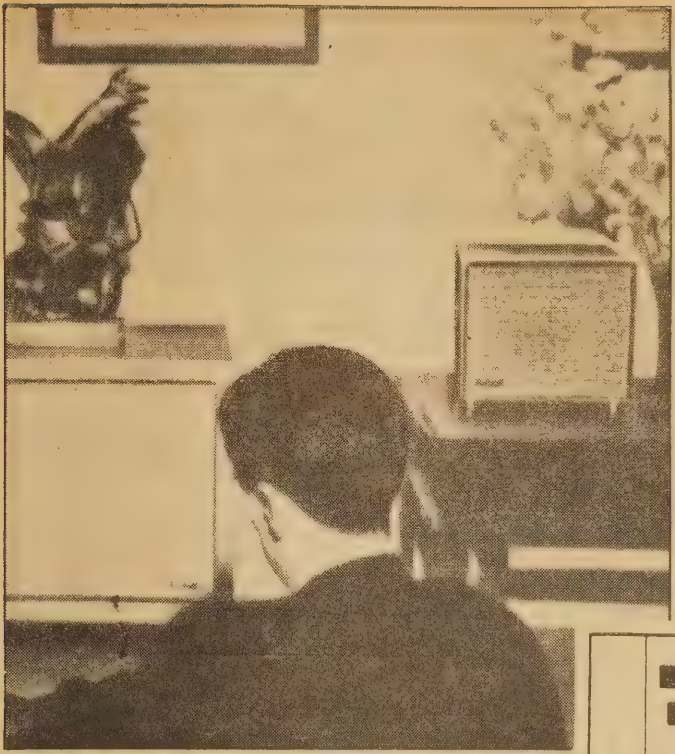
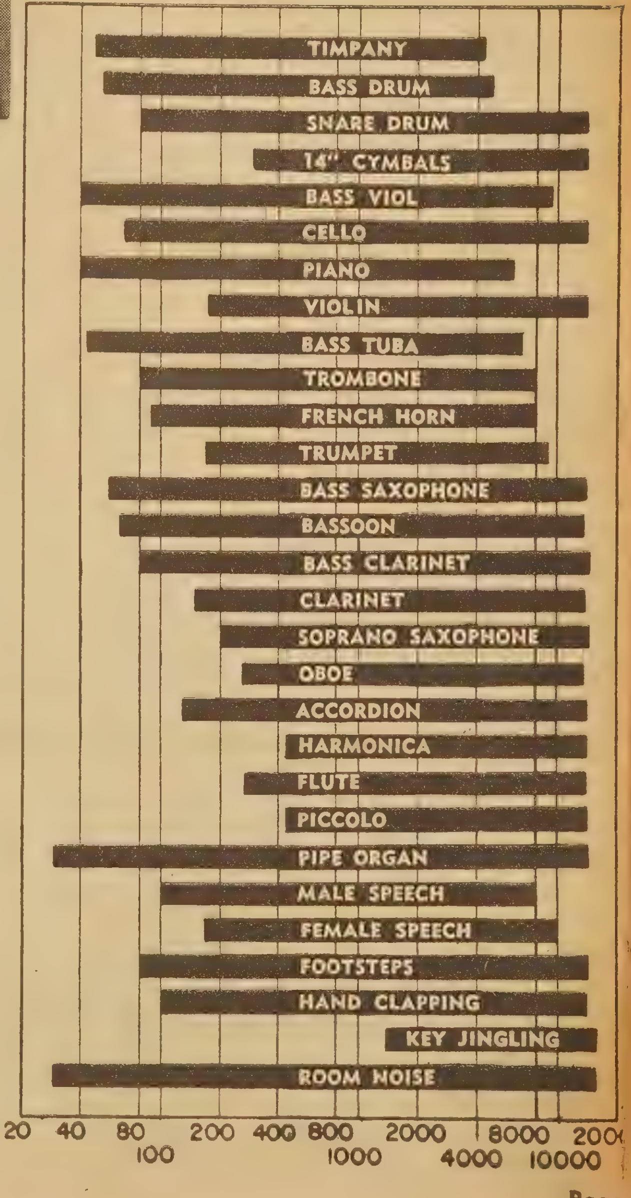


Illustration shows one approach. The large enclosure houses a single woofer for both channels. Speakers are added left and right for the stereo channels.

Fig. 1, below—This diagram shows that no sounds of value to the stereo listener lie entirely below the 300 cycle barrier. Just about everything works both sides of the border line.



Knowing some of the popular approaches to stereo speaker design, let's go back to the one-woofer approach and see how it stands up in the light of a closer look at the non-directional base argument. Remember first that the purpose of any hi-fi system, whether mono or stereo, is to reproduce **music.** Now, do musical instruments respect the 300 cps electronic curtain?

Take a look at Fig. 1. This is based on data presented by W. B. Snow of Bell Telephone Laboratories. Note that there are exactly four instruments, including small cymbals, whose entire range lies above 300 cps. The others are the woodwinds, oboe, flute and piccolo. **Nothing** lies entirely below the 300-cycle barrier. Everything else works both sides of this border.

Consider just what this means in terms of a single-woofer hi-fi stereo system. Take the piano for instance. On this instrument, 300 cps lies just about in the centre of its fundamental range, between middle D and E.

If you should place your full-range speaker at the right, with the squawker at the left, you're going to hear a mighty disjointed piano, with the bass to the right of the treble! Similarly, almost every other instrument of the orchestra will jump back and forth between the two sides of the room, depending upon whether it is playing above or below 300 cps.

THE 300 CYCLE RULE

Now let's examine the 300-cycle rule itself, to see if it really is valid. In the first place, the authorities cited all go back to the early 1930's. The data was gathered in research aimed at a top-notch telephone communications system. Nobody will deny that we have by far the best phone system in the world, but telephone speech communication is a far cry from hi-fi audio.

Furthermore, a lot has happened in the last quarter-century. The laws of physics haven't been repealed, but instruments and measuring techniques have advanced tremendously in that period. Isn't it entirely possible that modern research would turn up entirely different data, or at least quite different conclusions?

The graph of Fig. 2, also based on the work of Snow, shows that there is no loudness difference between the two ears at frequencies below 300 cps. This data was first presented in 1934. That same year, Harvey Fletcher showed that sounds with wavelengths of 2.5 feet or more (about 300 cps and down) were not inter-

The WARBURTON FRANKI Page

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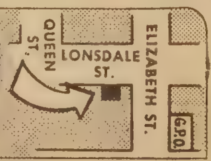

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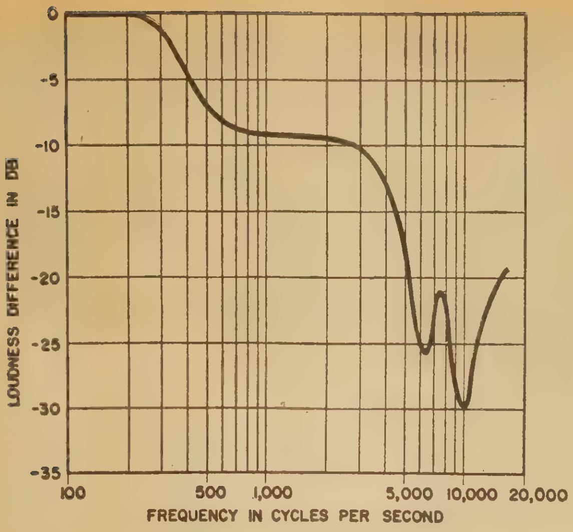
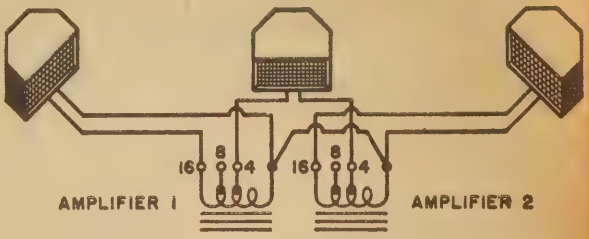


Fig. 2, left, based on the findings of W. B. Snow in 1934, demonstrates that there is no loudness difference between a person's two ears at frequencies below 300 cycles.

Fig. 3, below, shows one solution for "hole-in-the-middle" effect of two-channel stereo. Third channel can be reconstructed by setting up a "phantom" speaker connection.



cepted to any degree by the head, and are therefore heard exactly alike by both ears. These facts have caused one manufacturer to state flatly that "it is impossible for the ear to determine direction below 300 cycles per second."

ANOTHER VIEW

Possibly so, but there just doesn't happen to be any musical instrument in captivity whose tones and overtones are limited to below 300 cps. Furthermore, even the authorities differ. The same Dr Fletcher whose findings have been (mis)-appropriated for the one-woofer sales pitch has also had something quite different to say on the subject.

In 1929 he wrote, "Even when using two ears, however, it is very difficult to locate the source of pure tones when the pitch is high. . . . As the frequency of the exciting tone approaches about 1,000 cycles, the uncertainty of locating the image becomes greater, and for many persons there is no localisation for the higher frequencies."

This is not to say that the highly respected Dr Fletcher has contradicted himself, nor even that his findings are in error. It is simply to point out that one can't take a given set of data, gathered for a specific purpose 25 or 30 years ago, and transfer it in a package to another application today out of hand.

To do so can lead to this kind of ludicrous syllogism:

1. The human audible range is 10 octaves.
2. Stereophony is apparent only between 300 and 1,000 cps, less than two octaves.
   Therefore, less than 20 per cent of all sound is stereophonic.

That is the sort of specious reasoning used to support the argument for only one full-range speaker in a stereo system. Never mind the curves, graphs, tables, statistics and equations. Make your own two-minute blindfold test. Get someone to play a bass instrument—any bass instrument — while walking around the room near you. If you can't follow the location of the sound with your eye shut, you've been wasting your time i hi-fi anyhow.

The original advice on stereo speake is still the only good advice: Use two c more identical systems, and the highe quality the better. Two or more? Sinc three-channel stereo is much better tha two, but we don't have it in the home a yet, many audiophiles prefer to recon struct a third channel, using signals c both the two existing channels, with "phantom" connection.

FILLING THE HOLE

This gives the reproduction more ful ness and alleviates the "hole-in-th middle" effect sometimes noticed wit two-channel arrangements. The circuit shown in Fig. 3, when three 16-oh speakers are used. Each side speaker co nects to the 16-ohm tap of its own ou put transformer in the conventional fas ion. The centre speaker connects to eac of the four-ohm taps. With the low en

(Continued on Page 121)

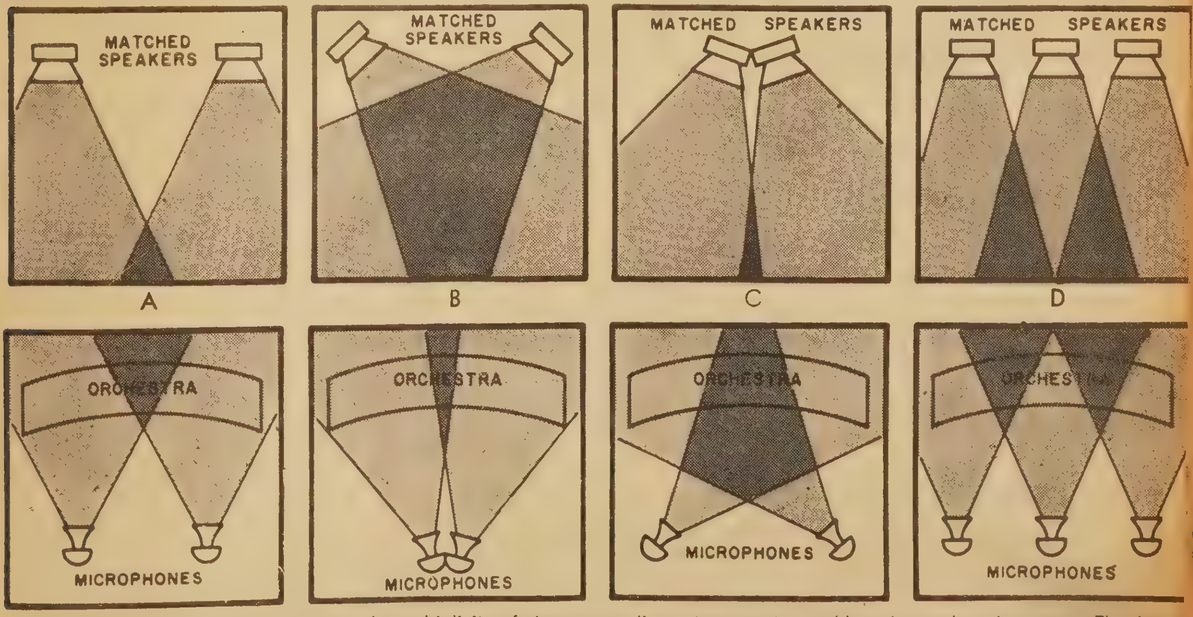
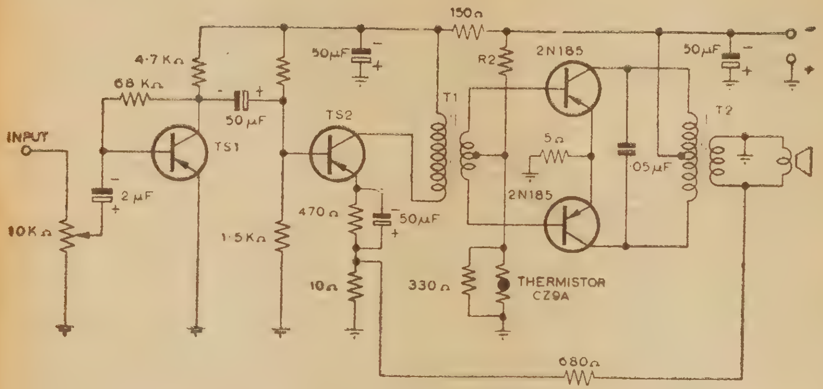


Fig. 4A, B, D and C demonstrates how the multiplicity of stereo recording setups creates problems in speaker placement. The Jense Stereo Director provides some of the flexibility needed for changing setups. The microphone setups shown are ideal and seldon is any used in such pure form. At opposite extreme is old multiple-mike setup of monophonic recording.

SETS THE STANDARD FOR TRANSISTORS



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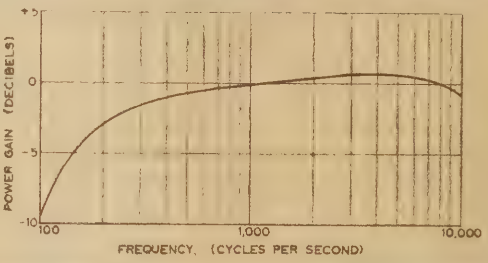
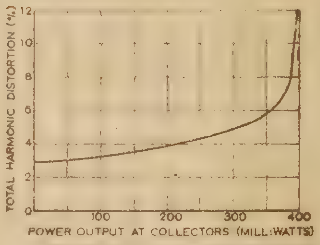




s circuit, which has been extensively tested, was igned to make full use of the performance of .C. transistors, used with standard commercial nponents.

tput power depends upon supply voltage and edance presented to the collectors of the output nsistors, and some typical examples are shown. nperature stabilisation is provided in each stage l includes the use of a thermistor in the output c.

Typical Performance, Using Commercially-available Components

Collector-to-Collector Load (ohms)	Supply Voltage (volts)	Driver Transformer Ratio	Bias Resistor R1 (ohms)	Bias Resistor R2 (ohms)	Heat Sink	Power Output (milliwatts)
500	6	3000/1300 C.T.	10K	8·2K	No	140
	9	3000/1300 C.T.	12K	12K	No	250
375	6	3000 2000 C.T.	7·5K	8 2K	No	180
	9	3000 2000 C.T.	10K	12K	No	300
300	6	3000, 2000 C.T.	7·5K	8·2K	No	230
	9	3000/2000 C.T.	10K	12K	Yes	350

Overall Power Gain—approximately 78 db

Driver Transformer:
Ratio: as shown.
Primary D.C. resistance: 1500 ohms total.
Secondary D.C. resistance: 80 ohms total.

Output Transformer:
Ratio: as shown.
Primary D.C. resistance: 3% of load impedance.
Secondary D.C. resistance: 3% of voice coil impedance.

Full technical information and applications data are available for all transistors in the S.T.C. range—contact:

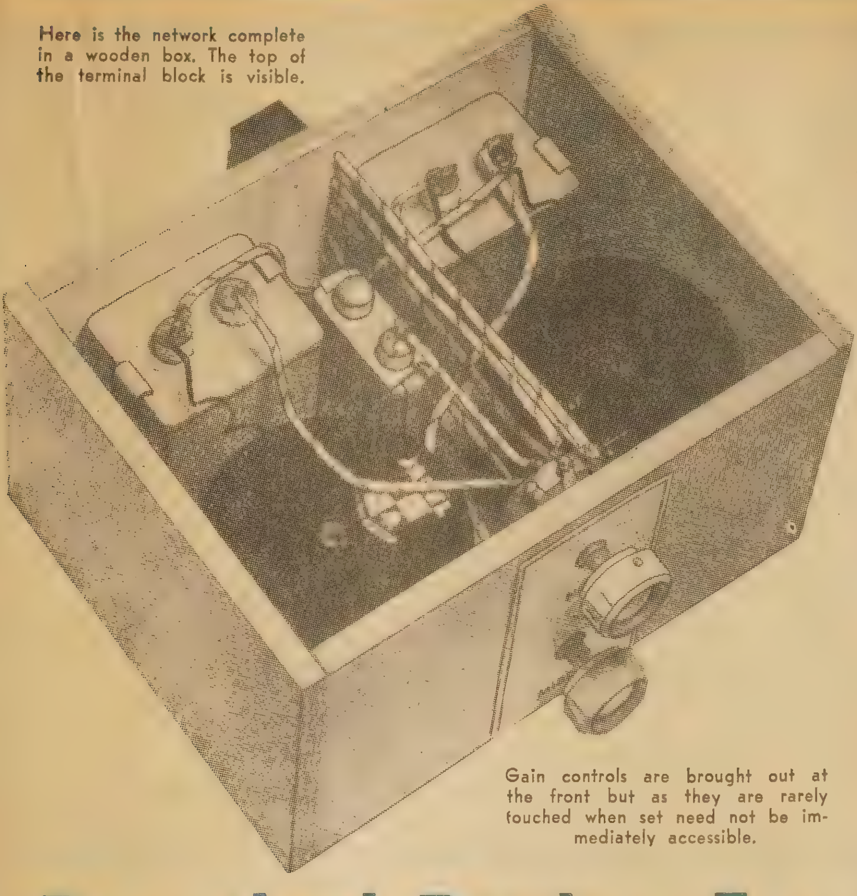
andard Telephones and Cables Pty. Ltd.

2-274 BOTANY ROAD, ALEXANDRIA
MX 0444

D

ASSOCIATE

Here is the network complete in a wooden box. The top of the terminal block is visible.



Gain controls are brought out at the front but as they are rarely touched when set need not be immediately accessible.

Practical Design For 3-Speaker Network

Practical information describing a network built in accordance with the design data already given, and which will be found to suit all the commonly used loudspeakers obtainable at the present time. Its physical shape is not particularly important and can be varied to suit component size.

IN our last two issues we have published some interesting and practical information on the design and construction of cross-over networks for loudspeakers.

In this issue we describe a practical unit which is very easy to make, which performs just as it should, and which will save you a good deal of money as against a commercial unit.

Before proceeding to the details it might be as well for the record to run through the general background of its design, which otherwise would have to be extracted from the previously published material.

The prime purpose of the network is to allow us to use three loudspeakers to cover the entire audio range instead of one without upsetting the character of the impedance load on the amplifier.

The first speaker is generally a large cone "woofer," or low frequency unit, designed especially to handle the powerful bass. As a rule it will be of 12 or 15 inches diameter.

The second speaker is generally smaller—in our case with an 8in cone—and it is intended to reproduce the middle registers, which it can do more efficiently than the larger cone.

The third is intended to reproduce the extreme high frequencies only, the jingles, the jangles and the highest harmonics which give the instruments their characteristic tone quality.

There are two valuable gains to be realised by using multiple speakers against a single cone.

The first is that the sound to which we listen is now radiated from a muc larger area in space than before, an we get far less of the concentrated soun beam so noticeable with even goo single speakers.

It is not hard to appreciate the mor relaxed type of listening which as a rul goes with the multiple arrangement.

And furthermore, the total powe output from the amplifier now divide itself into three shared channel although it must be admitted that th power required for reproducing sound in the middle and upper registers is fa less than in the lower.

The second important advantage is i reduced intermodulation distortion pro duced by the loudspeaker system.

The task of reproducing the full rang of frequencies by a single cone is reall too much for even high quality typ if low distortion is to be achieved. Whe it is reproducing a complex wave it impossible for some reaction not to tak place between different frequencies an it is even more dangerous and difficu to avoid when the band of frequenci involved is a wide one.

INTERMODULATION

The intermodulation is due to mec anical non-linearity of the loudspeak cone, and is not primarily a function the electrical input.

In practice the effect is probably mu worse than tests would lead us to b lieve, for it is extremely difficult measure accurately degrees of inte modulation where complex wavefor are concerned.

At any rate it is generally accepte and can usually be demonstrated, th multiple speakers are the best prop sition where quality and price are n controlling factors.

Reproduction from them is inevita cleaner and easier to listen to.

Splitting up the range is not a cu all for loudspeakers which are fun mentally poor in quality, but an i provement should be appreciated in cases because of the less stringent c ditions we are imposing on them. makes the life of all grades of lo speakers very much easier.

Having decided to use multi speakers, the next task is to provi some means of feeding to each o that portion of the spectrum it is quired to handle.

At some point we must decide t the output from the amplifier to the b speaker shall cease, and be diverted the middle speaker. And, if we use third speaker, the same process sho take place at a higher point in the f quency band.

CROSS-OVER NOT SHARP

In practice it is not possible or e desirable to make this "cross-over" p a sharp one. Instead we will hav region in which the power for speaker is reduced and the power the next is increased, the whole op tion taking place smoothly so that th is no apparent rise or fall in the t output due to this change.

From the discussions which took p in the previous issues, it will be evi that one can make networks gi various rates of attenuation above below the design cross-over point. that each network has its uses. simplest to make is the quarter-sec

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PL41.

type which gives an attenuation of 6 db per octave, although by using a half section circuit we can achieve substantially 12 db per octave which most people find a better rate to use.

Looking at the designs for commercial networks which are available, and going back into our own experience, we would also support the claims for 12 db per octave, and that is the basis of the unit described here.

As the circuit will show, it will require both a choke and a capacitor in each side of the circuit to obtain this attenuation figure, so that only the cross-over between the low and middle frequency speakers is a true half section filter.

The high frequency speaker is merely fed from the middle frequency section of the network through a blocking capacitor which, by attenuating the input fed to it at all but the upper limits of the spectrum, ensures that it will be effective over the required range and will not be damaged by the power of the lower frequencies.

When such a speaker is included, we generally arrange that the middle frequency speaker will have a falling response in the region in which the tweeter takes over so that the two will be complementary without the need for further filtering.

It is obvious, therefore, that if the middle frequency speaker has a good response in its extreme top end, it could be used on its own to make a two-speaker system simply by omitting the 2 mfd capacitor from the circuit, and without affecting the cross-over point of the network.

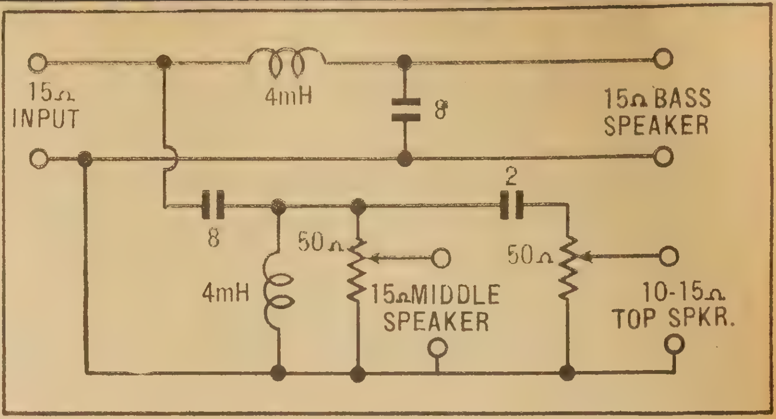
SETTING THE POINT

There are many different ideas about where the cross-over point should be set, and here we must be guided not only by what we would like but by what is suitable for the speakers themselves and the components of the network.

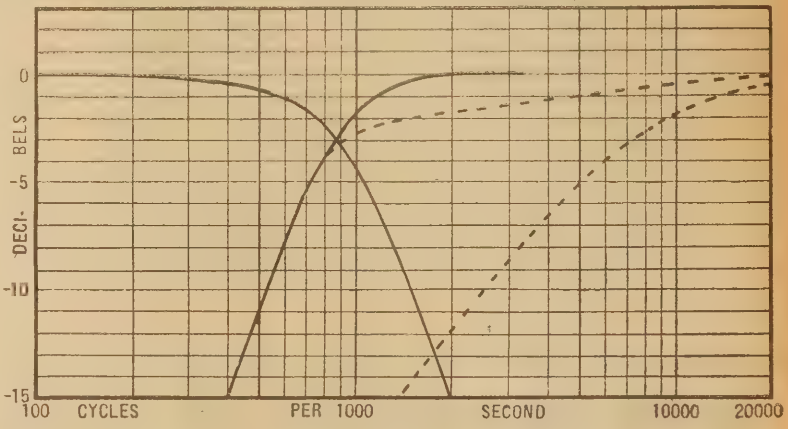
In this instance we have used a point about 800-900 cycles which coincides with that recommended by Wharfedale, one of the most popular of all three-speaker systems.

It is also a convenient point for component values, and we find that both the chokes and capacitors needed are of useful sizes and practical price.

The exact cross-over in practice does not appear to be very critical; a variation of 100 cycles either way is probably of little significance. What is important is that the transfer of power from one section to the other should not leave a peak or a dip in the curve at that point.



The circuit recommended by Wharfedale for use with their speakers. This circuit has individual output controls for both middle and top speakers to allow correct tonal balance to be achieved. It is universally applicable.



Set of curves showing the measured performance of the network.

The graph reproduced here was actually drawn for an earlier version of this circuit, and it clearly illustrates what is wanted.

The cross-over point here is about 870 cycles, and at that point each of the curves has fallen to 3 db below reference, measuring voltage developed across each section of the network.

The curves for the network illustrated were indistinguishable from these results.

Under these conditions, when the two curves are combined, the total power available from the network should be the same throughout its range.

The dotted curves which indicate the voltage division between the middle and high frequency speakers show that there is some modification to the curve for the middle speaker when the third unit is added and once again a combination of the two curves should show that the loss in one is made up by the contribution from the other.

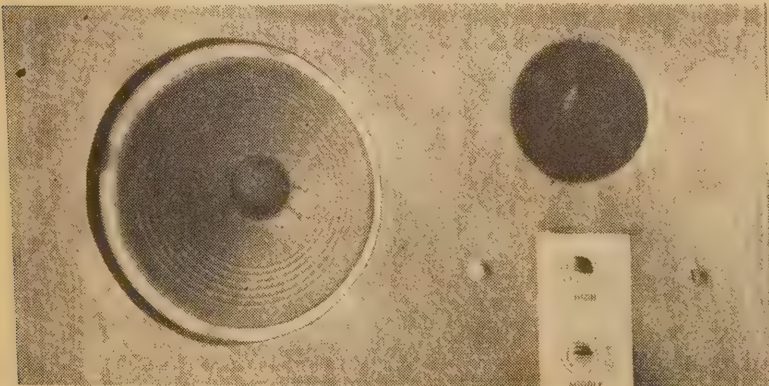
Thus it is fairly obvious that the net work is very close to being a constan impedance load which is the aim of it design.

NOT RESISTIVE

We know, of course, that loud speaker do not represent a resistive load, but because the active elements are coils o wire, are substantially reactive. As suc their impedance will rise with frequency and there are many variables in desig and operation which make the degree c variation hard to estimate.

Despite this it is surprising how we results on speaker and resistive load wer found to agree on test.

Although the network can provide fc an even and controlled division of powe between the speakers in the system, cannot take care in itself of difference



Here is a baffle mounting one 8-inch and one 3-inch speaker with the network beneath the latter to illustrate one possible method of housing.

acoustic efficiency between the loudspeakers.

Fortunately the middle and high speakers are generally more efficient than the woofer, and we can overcome this difficulty by including a pair of simple volume controls in the circuit.

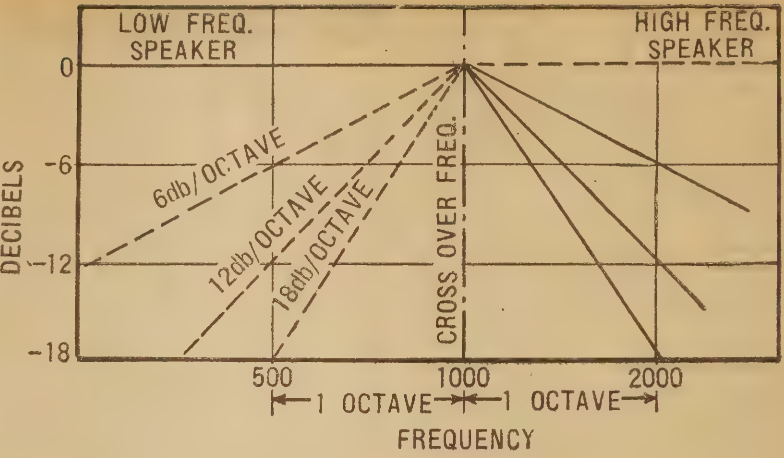
These have a value of 50 ohms, high enough not to affect seriously the terminal impedance of the network.

The effect of the consequent series resistance in the voice coil circuit of the middle and high speakers is not particularly important, but it would be intolerable in the case of the bass speaker. The effect of the amplifier damping on one resonance is a vital factor in low requency performance, and it is essenial not to add any external resistance into the circuit which would prevent the ull effect of a low amplifier output impedance being obtained.

AVOID LOW VALUES

The component values for the network ust be worked out with reference to he nominal loudspeaker impedance, and this case it is 15 ohms. This value is lmost universal in the high quality peaker field and, although we know it ill not be valid for all frequencies, it an be assumed as a satisfactory workng point for all speakers of or about his figure. We say this because some f the high frequency speakers might be uoted as 10 or even 8 ohms nominal npedance, but these will be satisfactory use.

What is important is to avoid speak's with impedances in the region of 2 hms, which is probably the next popur class.



This graph illustrates the principle of a speaker divider network and the various rates of cut-off above and below the cross-over frequency which can be obtained and frequently used.

To use 2 ohm speakers is to completely invalidate the curves as shown, and such speakers will be unsatisfactory unless a new set of component values is worked out.

And even then it will be found that these values will be uneconomical or even impracticable to achieve, and due to the introduction of losses which are neglible at the higher impedance, the performance curves will not be nearly so good.

As it is, the losses introduced by the network should not be greater than about 1 db.

One advantage of the circuit used is that both chokes and capacitors are of the same relative values. Both are also conveniently sized and reasonably economical to obtain.

The chokes we used have been wound up by one manufacturer to the specifications given in our last issue, and their inductance worked out virtually as calculated.

STANDARD 19 inch RACKS

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PHONES: BL 1300, BL 4556

The capacitors are standard 200 volt working types which should be obtainable readily, although probably not a stock item with most retailers.

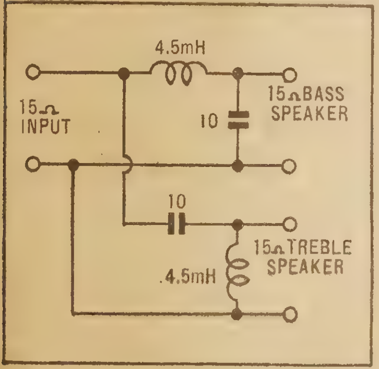
They allowed us to make up the network in a compact wooden box, but there is no reason why large capacitors as might be obtainable from disposals sources cannot be used if you make your box larger.

As a matter of fact the physical size and even arrangement of the parts is not critical, as long as the coils are not mounted hard up against each other in such a way as to couple them tightly together.

Mounted as we have them, short circuiting one of the coils while measurements were being made on the other had no effect on results, as would undoubtedly have been the case if noticeable coupling had been present.

In assembling the network we first of all made the box with a detachable lid from scraps of ¼in plywood, and then mounted the coils and capacitors to the bottom.

Before screwing them into place we mounted the two gain controls to the front, which might have been awkward with the coils in place.



These half section network values have been recommended by Goodmans, but in practice results should be indistinguishable from those obtained from the circuit as described.

Wiring up is a simple job. It is a good idea to use different coloured insulated wire for the earthed leads and those concerned with the output of each speaker, so that you won't get lost when sorting them out to run through the back and connect with the terminal block.

The block is useful in making connections to the respective speakers. Two separate leads for each is much neater than accommodating a common earth lead for three circuits.

ELECTROLYTICS

When the unit was wired up and tested, the lid was screwed into place. Those who are fussy could fill it up with pitch, but personally we think that is unnecessary and very messy.

The data given in last month's issue would indicate that electrolytic capacitors can be used with certain precautions, and they are certainly better than nothing. But we think the stability of paper and oil filled capacitors is of great value.

Check also on the actual capacitance of your 8 mfds capacitors particularly if of wartime origin Check them for leakage too, if you can, for although they require no great voltage rating, their condition should be good.

TWO OUTSTANDING PRODUCTS . . . from a famous maker

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ELECTROSTATIC
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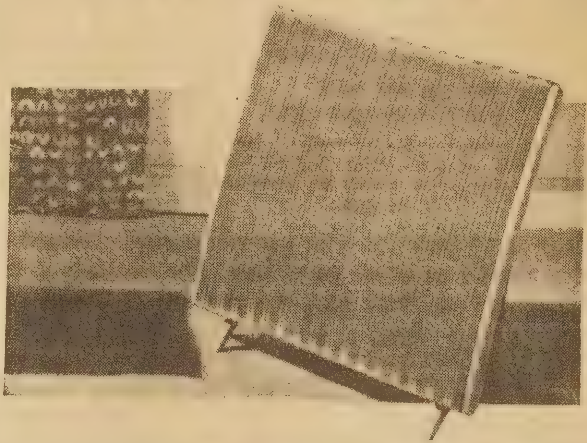


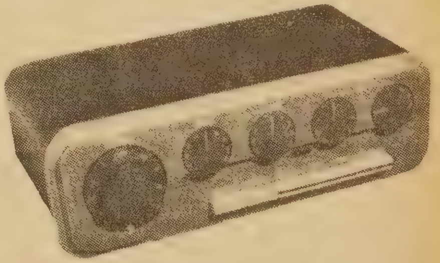
Hailed as the most significant advance made in reproducing equipment—this unique unit is now available from Audio Engineers.

When you hear the instrument you will have a new listening experience

Full range, distortion-free sound, flat response, freedom from the beaming effect common in conventional loudspeakers, yet with total dimensions of 35in wide, 31in high, 11in deep and a weight of only 35lb.

As illustrated, this unit is ready for connection to 15 ohm amplifiers, and is supplied complete with built-in power supply.

The
QUAD
22 STEREO
CONTROL



Unique in conception, outstanding in design—this undoubtedly ranks amongst the best. The unit provides comprehensive stereo-mono operation from discs, tape, radio and microphones, when used with two Quad 11 power amplifiers.

Full control facilities are available with separate bass and treble controls, filter and slope controls, balance control and push button function—equalisation selection. Effectively this is two monophonic controls, yet all is contained in the same size case as the standard Q.C control.

The control may be used with one power amplifier when expansion to stereo operation is delayed, thus allowing simple conversion to stereo by adding a second power amplifier.

These and all other items of quality sound reproduction equipment are available from:

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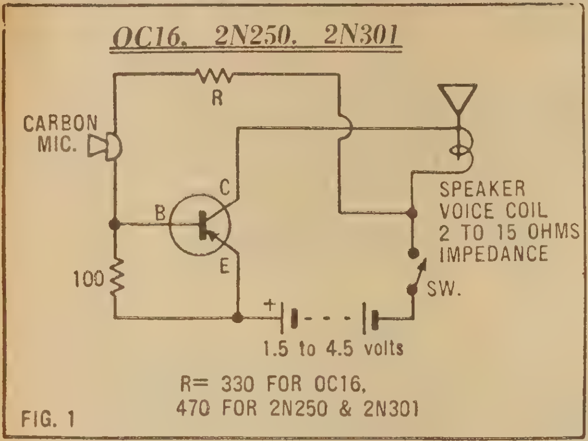

OC16, 2N250, 2N301
R
CARBON MIC.
B
C
E
100
SPEAKER VOICE COIL 2 TO 15 OHMS IMPEDANCE
SW.
+
1.5 to 4.5 volts
R= 330 FOR OC16, 470 FOR 2N250 & 2N301

FIG. 1

One transistor, mic., speaker, battery and two resistors make a public address system. The circuit has disadvantages, but it does work.

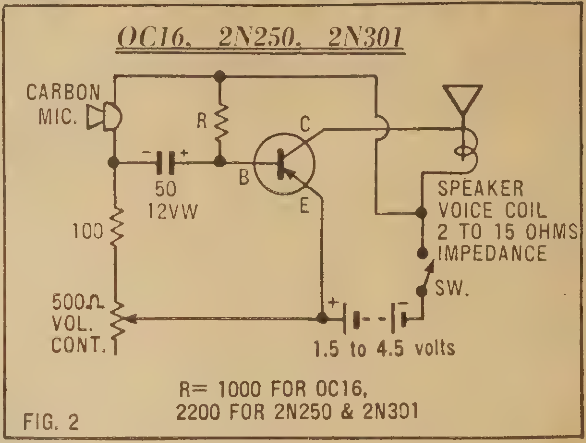

OC16, 2N250, 2N301
CARBON MIC.
R
C
B
E
50 12VW
100
500Ω VOL. CONT.
SPEAKER VOICE COIL 2 TO 15 OHMS IMPEDANCE
SW.
+
−
1.5 to 4.5 volts
R= 1000 FOR OC16, 2200 FOR 2N250 & 2N301

FIG. 2

A few components added to the circuit of Figure 1 make an amplifier which could be considered seriously for many applications.

By taking some liberties with normal design procedure, it is possible to make some very simple transistor public address amplifiers. The circuits in this article are worth trying simply for the experiment or they may be put into service where a portable amplifier is required.

THE simplest amplifier, Figure 1, requires only a transistor, battery and one resistor, in addition to the carbon microphone and speaker. Impedance matching between microphone and transistor and transistor and speaker are anything but optimum. Further, we are sure that speaker manufacturers would not recommend passing this amount of direct current through the speaker voice coil.

However, the amplifier works and makes more noise than we would care to do for any length of time without its aid.

Any battery delivering between 1.5 and 4.5 volts may be used to power the amplifier. Volume is limited on the lower voltage, and we do not recommend more than 4.5 volts because the current flowing in the speaker, transistor and microphone can become excessive. Two lead-acid cells in series (4v) are ideal, but the amplifier may be operated with 1, 2 or 3 dry cells in series. They should not be the smaller types because the current drain is about 200 mA.

Speakers with 2 ohm voice coils will work, but the impedance match to the transistor is not the best and both amplification and maximum power output are below the optimum. Results improve as the speaker voice coil impedance increases and are excellent with a 15 ohm speaker.

A disadvantage of the circuit of Figure 1 is that the standing collector current of the transistor varies with the position of the microphone, making for very high distortion with the microphone in certain positions. By adding some extra parts, the transistor collector current can be made independent of the microphone. In an amplifier intended for permanent use it is more satisfactory.

Collector current will still vary with emperature, but a more elaborate stabilsing circuit is a bit out of place in so imple an amplifier. Up to the highest likely temperature, however, the transistor will be safe.

At the same time, if it is convenient, it is a good idea to mount the transistor firmly against some metal object which will conduct the heat away readily and dissipate it into the atmosphere. This will keep the transistor temperature rise to a small number of degrees.

Where it is desired to operate a transistor at high ratings a special piece of metal designed to present a large surface area and have good thermal conductivity is used. Effective area is sometimes increased by finishing the "heat sink," as it is called, in a dull black.

The OC16 is provided with a mounting stud and suitable washers, two of them being of the mica variety so that the transistor can be electrically insulated from the heat sink if necessary. Better heat transfer will be obtained if the mica washers are omitted, but, of course, this means that the heat sink must be insulated from all other parts of the circuit. By the way, the OC16 and the OC16G can be interchanged in these circuits.

Both the 2N301 and the 2N250 mount with two small screws. Four holes are required, the two additional holes being for the base and emitter connections. All transistor connections are identified in Figure 3.

The performance of the circuit of Figure 2 is quite remarkable for so simple an amplifier. With 4 volts and a 15 ohms speaker you would not normally be able to have the speaker and microphone in the same room with the volume control fully advanced.

By the way, if you do not want a variable volume control you can substitute a single resistor for the 100 ohm resistor and the 500 ohm pot. in series. Its value could be any value between 100 ohms and, say, 680 ohms.

Gain of the OC16 is slightly less than the other two, but should be adequate in the circuit of Figure 2.

Some loudspeakers may work better with one polarity than the other. It is a good idea to try reversing the speaker leads.

Total current drain of the circuit of Figure 2 is less than 250 mA with a 4-volt supply.

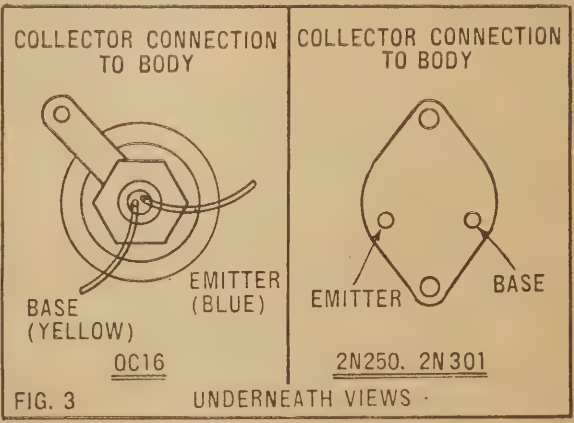


FIG. 3

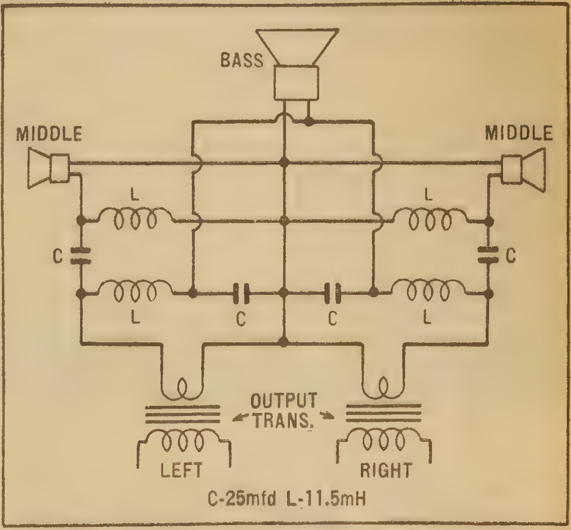
Here are the connections to transistors suitable for use in the amplifier. Types 2N250 and 2N301 are similar both physically and electrically. Do not attempt to use smaller transistors.

A READER BUILT IT!

Gadgets and circuits which we have not actually tried out, but published for the general interest of beginners and experimenters.

ECONOMY MULTI-SPEAKER STEREOPHONIC SYSTEM

The most expensive item in any high quality multiple speaker sound reproducing system is the low frequency speaker with its attendant large baffle or enclosure. It is still possible to have many of the benefits of stereo with a single low frequency speaker and thereby save money.



C-25mfd L-11.5mH

☆

Mr. Ritter's proposed arrangement for use with his 15 ohm speakers. Values for 15 ohm and alternative impedances are given in the table below.

☆

Our contributor, Mr A. C. W. Ritter, f Ethelton, South Australia, has transated some data on such a system from Dutch magazine. He has not tried he system yet, but there may be other eaders who would like to do so.

Output from the two channels is fed eparately to the middle and high freuency speakers but combined in the ne low-frequency speaker.

The crossover frequency in this case s given as 300 cps. which we believe o be a little on the high side but, preumably, someone overseas has tried this requency and is satisfied with the reulting stereophonic effect.

No provision for tweeter speakers is nade on the circuit reproduced here, but hese could be connected in parallel with he medium frequency speakers via a oupling capacitor. The value of capacior could best be determined by experinent, but we would suggest that you tart with 0.1 uF.

Original wire specification is 1 mm. ut either 18 B and S or 19 SWG should e near enough. Similarly, the other imensions given have been calculated pprox. from the original metric.

SPEAKER IMPEDANCE	C (uF)	L (mH)	TURNS	FLANGE DIAM.	WIRE LENGTH REQUIRED
3 ohms	125	2.3	275	2 3/16in.	102 feet
5 "	75	3.7	350	2 3/8in.	145 "
7 "	60	5.0	400	2 9/16in.	175 "
8 "	50	6.0	425	2 9/16in.	185 "
10 "	35	7.0	470	2 11/16in.	220 "
15 "	25	11.5	600	3 1/8in.	305 "

Wire gauge 18 B & S or thereabouts.

A READER'S CIRCUIT FOR A FIELD TELEPHONE

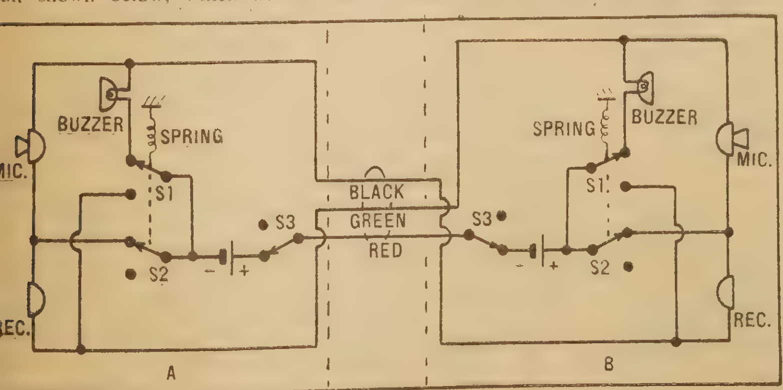
Mr Nicholas A. Doats, of Rose Bay, N.S.W., forwards the field telephone ciruit shown below, which he has constructed with excellent results.

He writes: "Using miniature buzzers, batteries, switches, etc., each unit was completely installed in a standard telephone handset. All switches were homemade and the miniature buzzers were procured very cheaply at the disposals store. The main communication line was vinyl-coated 3-core flex.

"Operation is simple. When A calls he depresses ganged switch S1S2 momentarily which sounds buzzer in B. The purpose of S3 is to shut off battery current when the telephone is in storage.

"I have found this particular unit most useful when orientating external TV antennae, one unit being on the roof and the other at the TV set."

Our correspondent does not go into mechanical details, but it would probably be a good idea to provide each handset with a plug so that the connecting cord can be folded conveniently when not in use. Don't use power plugs. These may accidentally be put in the wrong place with lethal results.



MAGNETIC SOUND

TAPE RECORDERS

FROM £65

OR £10 DEPOSIT

Nowhere else this complete Specialist service . . nowhere else so many latest models.

☆ *The only firm in Australia that DOUBLES the manufacturer's guarantee on tape recorders.*

PYE TECNICORDA

THE TAPE RECORDER SPECIAL OF THE YEAR

OURS ALONE IN AUSTRALIA AT THIS OUTSTANDING PRICE — BRAND NEW 1959 MODELS FOR ONLY £98/17/6—OR £9/17/6 DEPOSIT AND EASY TERMS. THIS SPECIAL CARRIES OUR FAMOUS 12 MONTHS GUARANTEE!

Anywhere else this brilliant tape recorder is priced at £119/14/-; we are actually passing on to you the full advantage of our mighty buying power--as Australia's only Tape Recorder specialists. The 1959 Pye Tecnicorda has everything:

★ 2 speeds; twin track; superb hi-fi reproduction; direct radio input for recording direct from your radio or gramophone. Complete with hi-grade crystal microphone. The greatest buy in Australia today!

STEREOPHONIC SOUND FOR THE HOME BUILDER

from our new American style Stereo and Hi-Fi Department

We have all the equipment you need, demonstrated side by side for comparison. Here you'll find all the great names stocked:

LEAK . . QUAD . . AEGIS . . GRAMPIAN . . ROGERS . . WHARFEDALE . . GOODMANS . . PYE . . ROLA . . THORENS . . CONNOISSEUR . . GARRARD . . PHILIPS.

STEREO PLAYERS:

★ BSR HF8—16 gns.
★ DUAL Autoplayer—£31/18/0
★ GARRARD VHF with cartridge—£30/6/6
★ GOLDRING-LENCO, less cartridge-£38/10/0
★ THORENS TD134L, less cartridge—£43/15/0
★ COLLARO MOTORS less pick-up——£28/10/0
★ GARRARD 301 (only a few available)

NEW RELEASES:

QUAD Stereophonic Amplifiers complete with control box	£115/5/-
QUAD Amplifiers only	£61/5/-
QUAD Control Box only	£54
QUAD AM/FM Tuner	£61
A full range of GOODMANS SPEAKERS — from	£15/8/7
★ ACCOUSTICAL RESISTANCE UNITS —	£6/10/9
GOODMANS 325 ENCLOSURE—fully imported —complete in veneered cabinet with Audiom 80, Midax, Trebax ARU 280 cross-over unit and attenuators	£211/8/2

INDUSTRIES

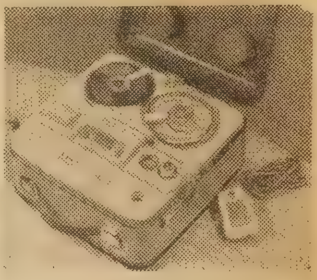
THE WORLD'S THREE FINEST IMPORTED TAPE RECORDERS

GRUNDIG

£139 - 10 - 0

FERROGRAPH

£239 - 2 - 9



TELEFUNKEN

£159 - 10 - 0

The wonderful thing about owning one of these machines is that you know you own the best in the world.

★ The Grundig illustrated offers you 2 hours superb recording and playback on one spool of double track tape. New precision place indicator enables you to select instantly any recording from the 1,200ft of sound tape. Complete with hi-grade condenser microphone and tape.

NOTE: WE ARE THE ONLY AUTHORISED GRUNDIG DEALER IN SYDNEY WITH SPECIALISED, ON-THE-SPOT REPAIR SERVICE MANNED BY GRUNDIG-TRAINED ENGINEERS. A FULL RANGE OF GRUNDIG PARTS & ACCESSORIES IS ALWAYS IN STOCK.

★ The Ferrograph illustrated is the finest fully-professional tape recorder in its field. The very latest stereophonic 4A/N Ferrograph is priced at £268. The special Stereo-add attachment for Ferrograph Tape Recorders is priced at **£90/9/2.** These are true connoisseur instruments.

★ New-release Telefunken illustrated incorporates a totally new styling, includes tape and high quality moving coil microphone and has provision for remote control. 2 speeds, twin-track — and the reproduction is magnificent!

SPECIAL RELEASE OF QUAD ELECTROSTATIC LOUDSPEAKERS

- ★ **LORENZ Hi-Fidelity Electrostatic Speakers — ideal for tweeters -- -- -- -- -- 32/6**
- ★ **STEREO LEVEL INDICATORS -- -- -- -- -- -- £8/7/6**
- ★ **STYLUS GAUGES—to tell you the weight of your pick-up 19/6**

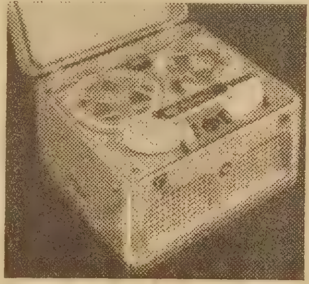
Full range of STEREO/MONAURAL NEEDLES AVAILABLE—
SPECIAL OFFER: Goldring 500 variable reluctance cartridge including 2 sapphires —£3/10/-—list price £5/10/-

EASY TERMS A PLEASURE ON ALL HI-FI AND STEREO EQUIPMENT

ANOTHER SUPERB TECNICORDA

£149 - 2 - 0

This model offers 2 speeds, separate extension loudspeaker with inbuilt mixer, plus an efficient public address system and a synchro drive for 8mm. film projection. A superb tape recorder!



LATEST AWA

£143 - 10 - 0

★ This leading maker's latest release has 3 speeds, and will record 8 hours on a 2,400ft reel of tape; 2 loudspeakers for brilliant hi-fi reproduction. Includes an inbuilt p.a. system. Which all adds up to real value.

HIRING—yes, you can hire a latest model tape recorder for just 25/- per day.

FREE CHECK-UP—throughout the year, on ou specialised equipment.

SPECIAL ON TAPES

Special purchase of long-play high-fidelity recording tape — unobtainable elsewhere a this fantastic price.

(mail orders please add postage)

- ★ **1,800ft 7in reel—only 65/9**
- ★ **900ft 5in reel—only 38/-.**

Attractively boxed, unconditionally guaranteed.

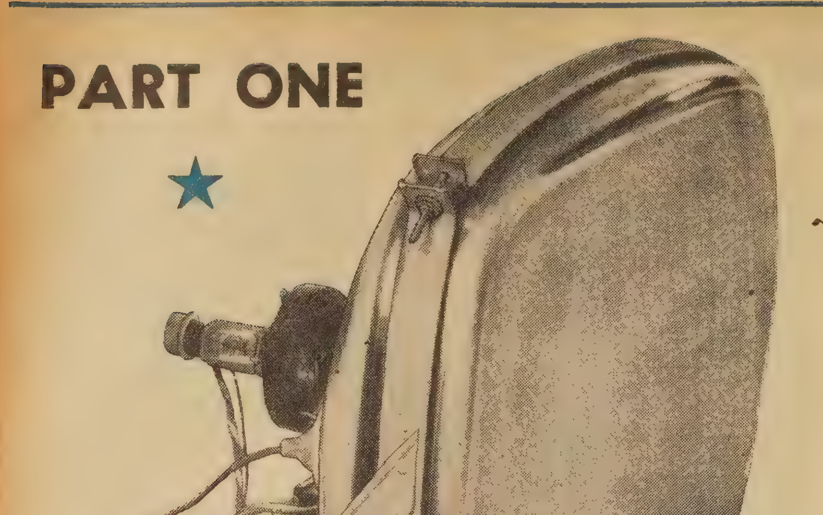
MAGNETIC SOUND INDUSTRIE

—the people with the buying flair and the staff of experts to show you how

BISLEY HOUSE, 387 GEORGE STREET.
(2 doors from Kodak). BX4440, BX4587.

PART ONE

★



A front view of the new receiver, indicating its much reduced front-to-back dimension. Note the wing nuts which hold the brackets supporting the picture tube. Note also the additional holes on the front face which allow the controls to be re-positioned to suit vertical chassis mounting.

The extra complication in this part of the circuitry has been offset by simplification elsewhere. A three-stage video IF system has been used which, nevertheless, gives plenty of gain in association with an efficient tuner.

The sound IF system is now fed from the plate trap of the video amplifier. With this connection, one additional stage and a ratio detector give ample audio gain, the level being unaffected by tuning and having a high degree of noise rejection.

By using two "spare" triode sections left over in other adjacent multiple valves, it has been possible to eliminate the individual synch. separator valve and even to achieve a marginal improvement in overall performance.

SILICON RECTIFIERS

By using silicon rectifiers in the H.T. circuit, the power transformer has been made smaller and cheaper and the total valve complement reduced to 14.

In all, we feel that this is a very practical, yet efficient receiver. It shows no sign of overload in our laboratory, when fed from a beam aerial on the roof pointed straight at the TV towers just across the way.

With the shield cage door partly closed to attenuate the signal, it will reproduce sound and lock on an image so vague that you can't tell the difference between a programme and a test pattern.

Its interlace, linearity and resolution are completely on a par with current commercial standards.

How To Build The 1959 TV Set

Here is the first article describing in detail the construction of our new 110-degree television receiver. It will take either a 17 or a 21-inch picture tube and can be adapted to suit either a vertical or a loughboy style cabinet. The new set combines excellent performance with maximum circuit economy.

THE basic ideas behind this new receiver were set out in the introducory article, last month, and readers will lready be familiar with its general ppearance.

Briefly, the basic differences between he new set and those previously describd stem from the use of the latest type icture tubes, having a very much abbreiated dimension, front-to-back, and a aximum diagonal beam deflection angle f 110 degrees.

Physically, this has made it worthwhile o reduce the corresponding chassis imension, so that the receiver can now e fitted into a modern "slim" cabinet, ith no bubble at the back to enclose e base of the picture tube.

The whole layout has been altered and simplified. No brackets are used, only a simple cover encloses the horizontal output components and all other components are readily accessible.

Electrically, the wider deflection angle has necessitated the use of a completely new type of vertical output circuit, as well as re-designed vertical and horizontal deflection components.

by Neville Williams

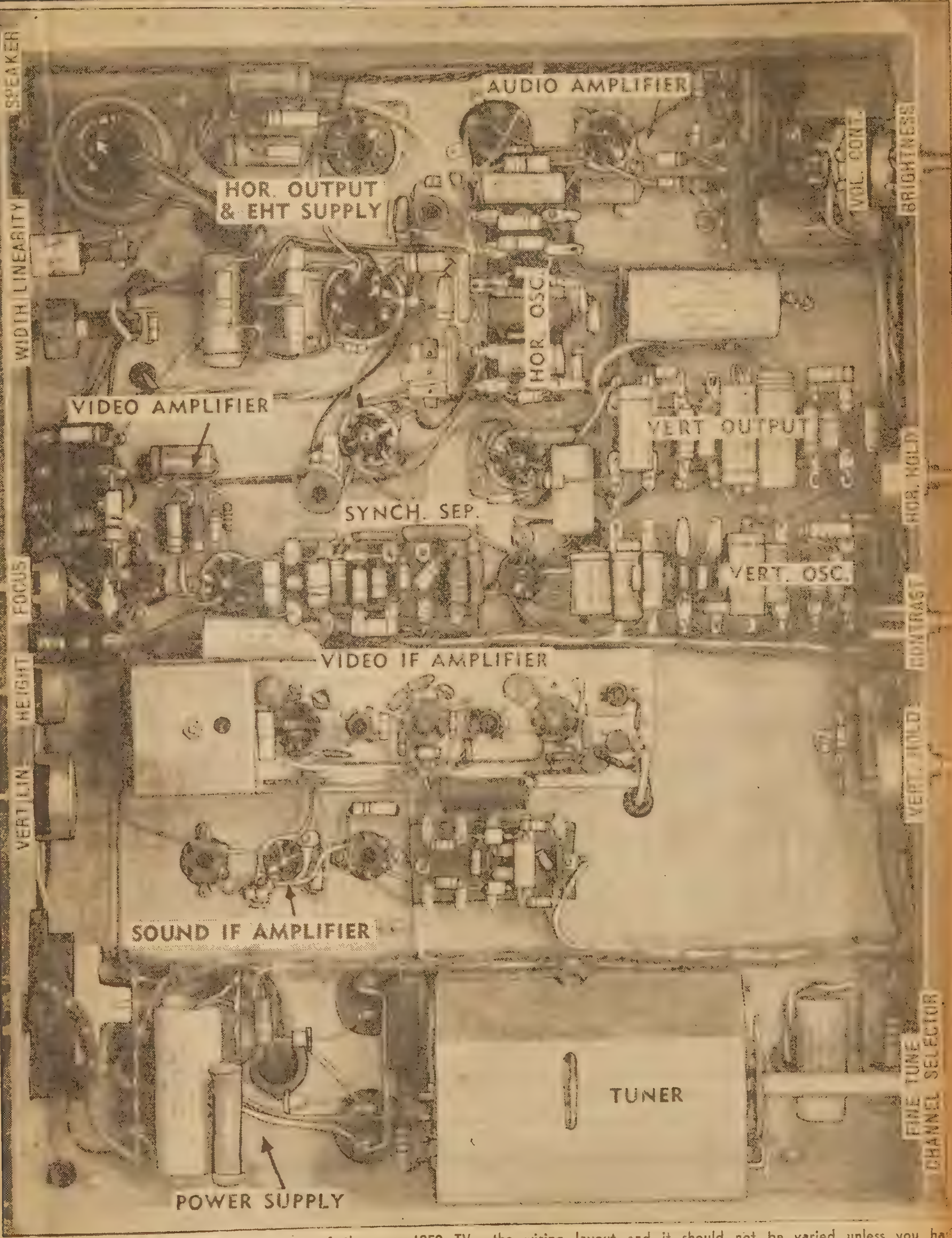
Who can build it?

Frankly, we've long since ceased to be surprised at the folk who do successfully build their own television receivers; at the very few who seem to get into any real strife in so doing.

For all that, however, there are a lot of soldered joints to be made and a lot of connections that you can get wrong. Therefore, we would not advise anyone to attempt such a project unless they can read a circuit easily, understand its general import and make a good job of the assembly and soldering.

If you're a member of a training group, with some assistance to fall back on, then these requirements can be relaxed somewhat and, in fact, quite a few colleges

AN UNDER-CHASSIS VIEW OF THE NEW TV RECEIVER


SPEAKER
AUDIO AMPLIFIER
HOR. OUTPUT & EHT SUPPLY
VOL. CONT.
BRIGHTNESS
WIDTH LINEARITY
HOR. OSC.
VIDEO AMPLIFIER
VERT. OUTPUT
HOR. HOLD
SYNCH. SEP.
FOCUS
VERT. OSC.
CONTRAST
VIDEO IF AMPLIFIER
HEIGHT
VERT. LIN.
VERT. HOLD
SOUND IF AMPLIFIER
FINE TUNE
CHANNEL SELECTOR
TUNER
POWER SUPPLY

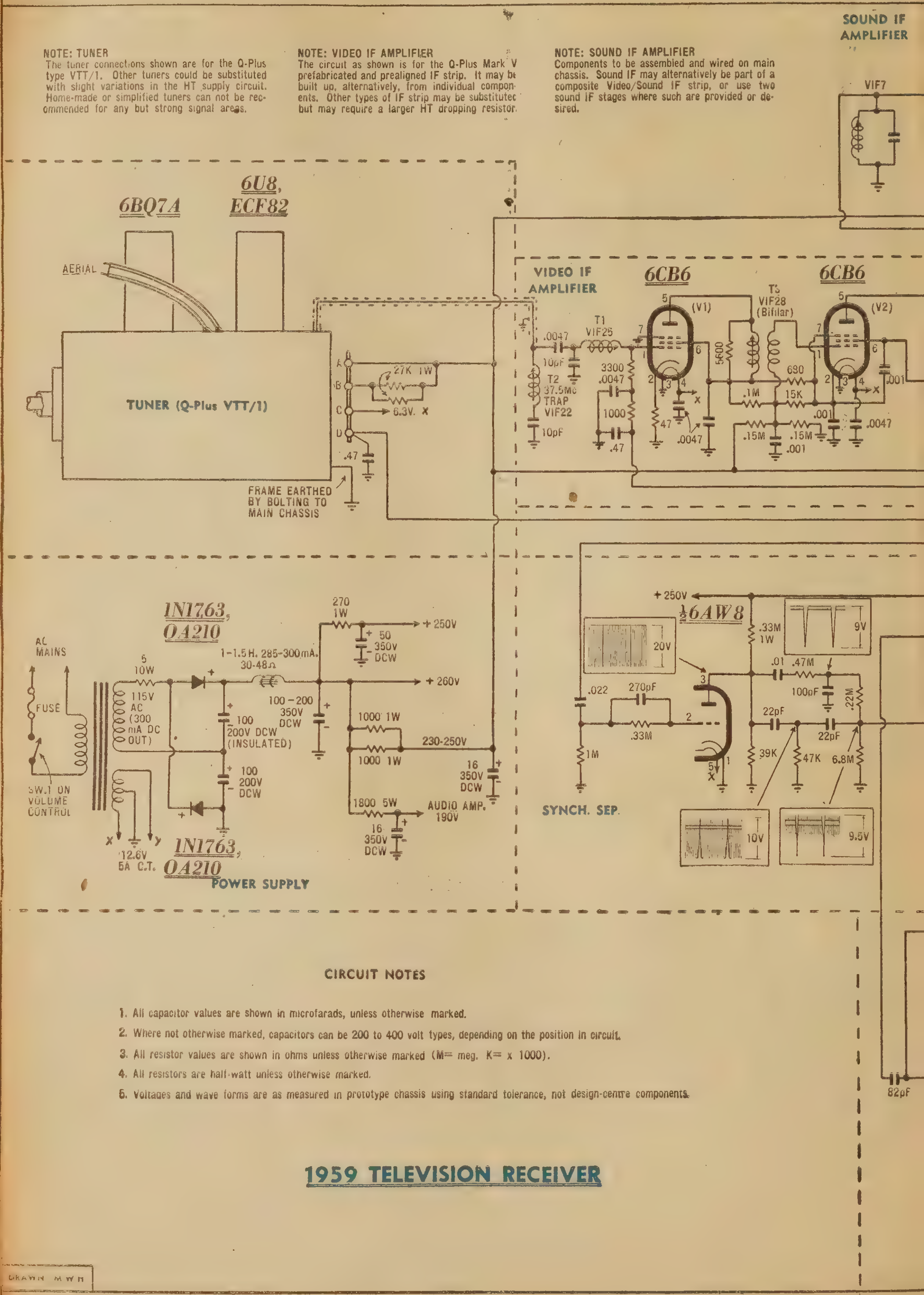
Here is a general under-chassis view of the new 1959 TV Receiver, with major sections of the wiring identified. Each of these sections will be individually explained and/or diagrammed to allow the original wiring and layout to be followed closely. Note the use of component panels which can be pre-assembled, then connected into the chassis. A great deal of care has gone into the wiring layout and it should not be varied unless you ha the strongest possible reasons for doing so. No shielding is us around the horizontal output circuitry beneath the chassis, but has been laid out to allow a shield to be added, if individu desire to do so. Current practice is to rely on proper layo rather than shielding to secure circuit isolation, minimising co

CIRCUIT DIAGRAM OF OUR 1959 TV RECEIVER W

NOTE: TUNER
The tuner connections shown are for the Q-Plus type VTT/1. Other tuners could be substituted with slight variations in the HT supply circuit. Home-made or simplified tuners can not be recommended for any but strong signal areas.

NOTE: VIDEO IF AMPLIFIER
The circuit as shown is for the Q-Plus Mark V prefabricated and prealigned IF strip. It may be built up, alternatively, from individual components. Other types of IF strip may be substituted but may require a larger HT dropping resistor.

NOTE: SOUND IF AMPLIFIER
Components to be assembled and wired on main chassis. Sound IF may alternatively be part of a composite Video/Sound IF strip, or use two sound IF stages where such are provided or desired.

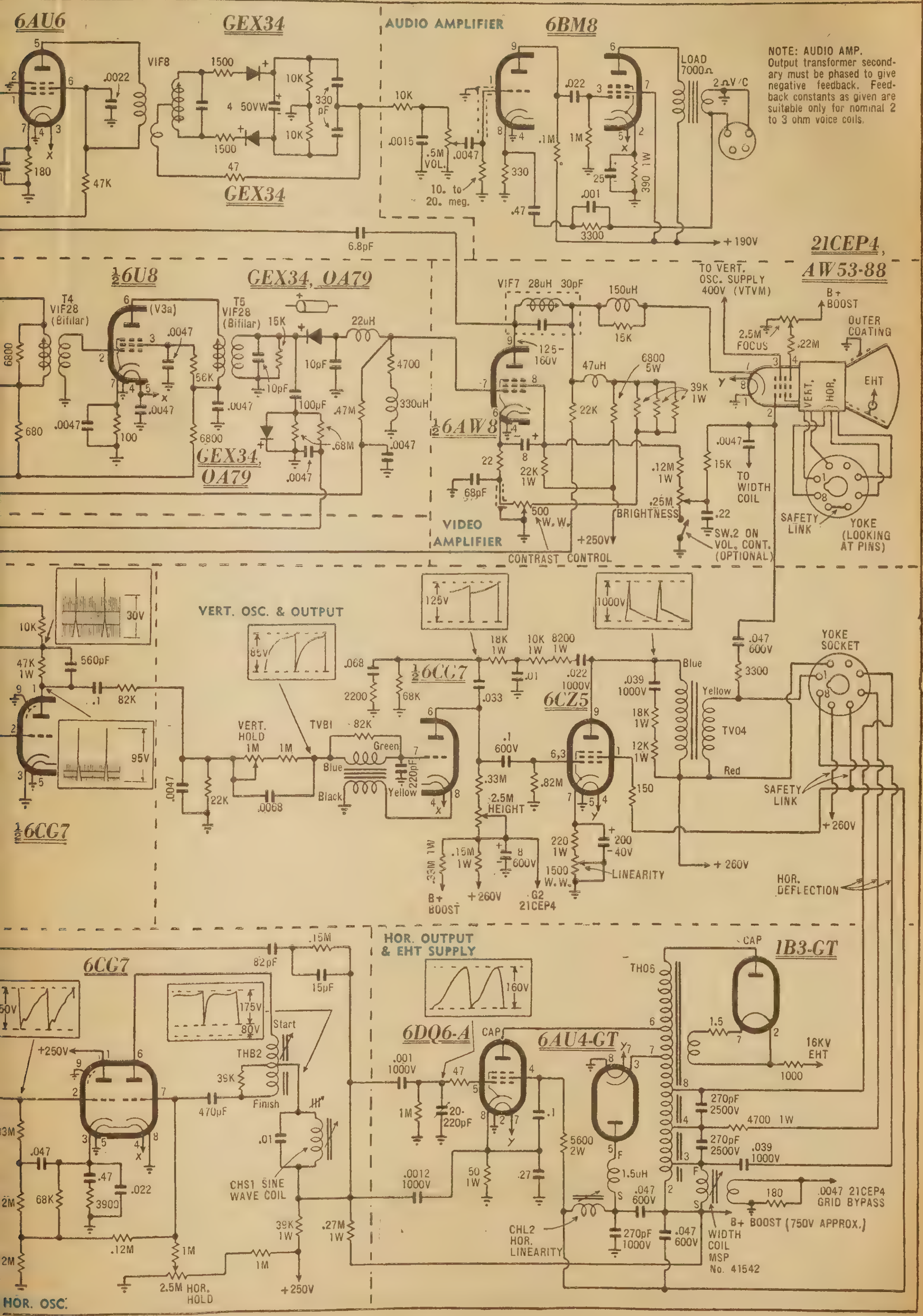

SOUND IF AMPLIFIER
VIF7
6BQ7A
6U8, ECF82
AERIAL
TUNER (Q-Plus VTT/1)
A
B
C
D
27K 1W
6.3V. X
.47
FRAME EARTHED BY BOLTING TO MAIN CHASSIS
VIDEO IF AMPLIFIER
6CB6
(V1)
6CB6
(V2)
T1 VIF25
T3 VIF28 (Bifilar)
.0047
10pF
T2 37.5Mc TRAP VIF22
10pF
3300
.0047
1000
.47
47
.0047
5600
.1M
.15M
680
15K
.15M
.001
.001
.0047
.001
1N1763, OA210
AC MAINS
FUSE
SW.1 ON VOLUME CONTROL
5 10W
115V AC (300 mA DC OUT)
1-1.5H. 285-300mA. 30-48Ω
270 1W
50 350V DCW
+250V
+260V
100-200 350V DCW
100 200V DCW (INSULATED)
100 200V DCW
1000 1W
1000 1W
230-250V
16 350V DCW
1800 5W
AUDIO AMP. 190V
16 350V DCW
12.6V 5A C.T.
1N1763, OA210
POWER SUPPLY
+250V
½6AW8
20V
.33M 1W
9V
.01
.47M
.022
270pF
.33M
100pF
.22M
22pF
22pF
1M
39K
47K
6.8M
10V
9.5V
SYNCH. SEP.
82pF
DRAWN MWH

CIRCUIT NOTES

1. All capacitor values are shown in microfarads, unless otherwise marked.
2. Where not otherwise marked, capacitors can be 200 to 400 volt types, depending on the position in circuit.
3. All resistor values are shown in ohms unless otherwise marked (M= meg. K= x 1000).
4. All resistors are half-watt unless otherwise marked.
5. Voltages and wave forms are as measured in prototype chassis using standard tolerance, not design-centre components.

1959 TELEVISION RECEIVER

ALL IMPORTANT VOLTAGES AND WAVE FORMS



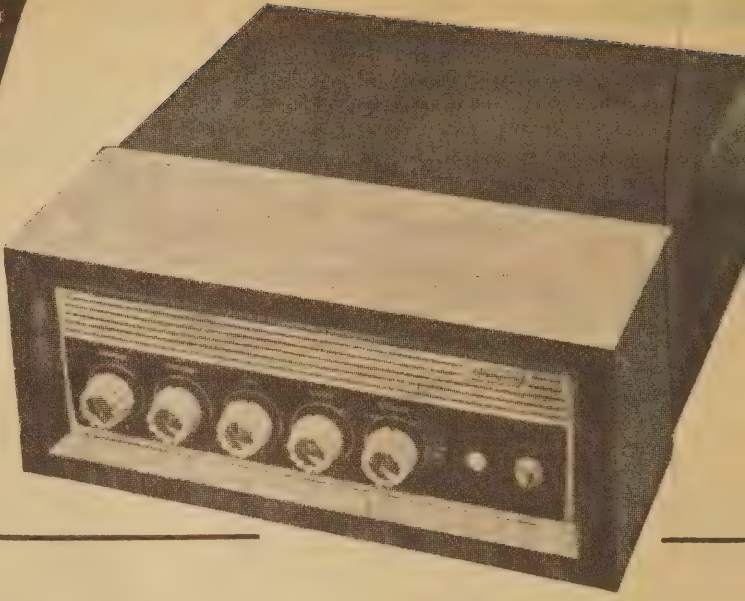
NOTE: AUDIO AMP. Output transformer secondary must be phased to give negative feedback. Feedback constants as given are suitable only for nominal 2 to 3 ohm voice coils.

6AU6
GEX34
AUDIO AMPLIFIER
6BM8
VIF8
LOAD 7000Ω
2Ω V/C
.5M VOL.
10. to 20. meg.
+190V
6.8pF
½6U8
T4 VIF28 (Bifilar)
(V3a)
T5 VIF28 (Bifilar)
GEX34, OA79
VIF7 28uH 30pF
150uH
125-160V
½6AW8
VIDEO AMPLIFIER
CONTRAST CONTROL
+250V
BRIGHTNESS
SW.2 ON VOL. CONT. (OPTIONAL)
TO VERT. OSC. SUPPLY 400V (VTVM)
21CEP4, AW53-88
B+ BOOST
2.5M FOCUS
OUTER COATING
EHT
VERT.
HOR.
TO WIDTH COIL
SAFETY LINK
YOKE (LOOKING AT PINS)
VERT. OSC. & OUTPUT
30V
95V
85V
125V
1000V
½6CC7
6CZ5
½6CG7
VERT. HOLD
TVB1
Green
Blue
Black
Yellow
Red
TV04
2.5M HEIGHT
LINEARITY
B+ BOOST
+260V
G2 21CEP4
YOKE SOCKET
HOR. DEFLECTION
6CG7
HOR. OSC.
50V
175V
80V
THB2
Start
Finish
CHS1 SINE WAVE COIL
2.5M HOR. HOLD
HOR. OUTPUT & EHT SUPPLY
160V
6DQ6-A
CAP
6AU4-GT
TH05
1B3-GT
16KV EHT
CHL2 HOR. LINEARITY
WIDTH COIL MSP No. 41542
B+ BOOST (750V APPROX.)
.0047 21CEP4 GRID BYPASS

THE Grampian

590 SERIES

"CONVERTIBLE" HIGH FIDELITY AMPLIFIERS



The release of the new stereo recordings has meant that a new approach must be made when considering your equipment, for although stereo reproduction has many advantages it may not be convenient to instal a full system at once.

The new GRAMPIAN "590" series has been produced specially to meet this condition and enables you to commence with a "mono" or single channel system at once and convert to stereo at any time.

The basic equipment consists of a control unit which is fitted with all the necessary controls and circuitry for both "mono" and "stereo" working. It is designed for use with crystal pickups and embodies equalising circuits for 78 r.p.m. and LP recordings. Wide range tone controls are also fitted.

Directly fitted to the control unit is a power amplifier, Type 584, having a push-pull output of 7 watts R.M.S. (10 watts peak). This assembly, the 590/1, forms a complete equipment to operate from conventional single channel discs, single channel tape recorders and radio tuner units.

Conversion of the above unit to stereo is simple. It is only necessary to fit a further 584 power amplifier in the mounting already provided and connect up. No alterations to, or extra parts are required for, the control section, and the unit will then operate as a stereo system with an output of 7 watts on each channel or as a single channel system with an output of 14 watts with two loudspeakers. The differential gain (balance) control for the accurate adjustment of stereo reproduction by matching the input signals from stereo discs and stereo tape recorders to the two identical power amplifiers is already provided.

It can, of course, be supplied initially in the stereo form, Type 590/2, with the two amplifiers already assembled and connected.

Both models are obtainable in chassis form for mounting into the user's own cabinet, or complete in an attractively styled wooden surround.

TECHNICAL SPECIFICATIONS	Type 590/1 Single Channel	Type 590/2 Stereo
Output power	7 watts (RMS) 10 watts (peak)	14 watts (RMS) 20 watts (peak)
Output Impedance	4 & 15 ohms	4 & 15 ohms
Input Impedance P.U.	1 Megohm	1 Megohm
Input Impedance Tuner/Tape	0.5 Megohm	0.5 Megohm
Input Sensitivity P.U.	0.5 volt	0.5 volt
Input Sensitivity Tuner/Tape	1 volt	1 volt
Hum and Noise	— 60 db	— 60 db
Distortion at full output	Less than 1% at 1 K/c	Less than 1% at 1 K/c

Controls:
Balance plus minus 4 db on each amplifier, total 8 db
Bass plus minus 8 db at 40 c/s
Treble plus minus 10 db at 15 K/cs
Selector Tuner, 78, LP, Stereo disc, Stereo tape.

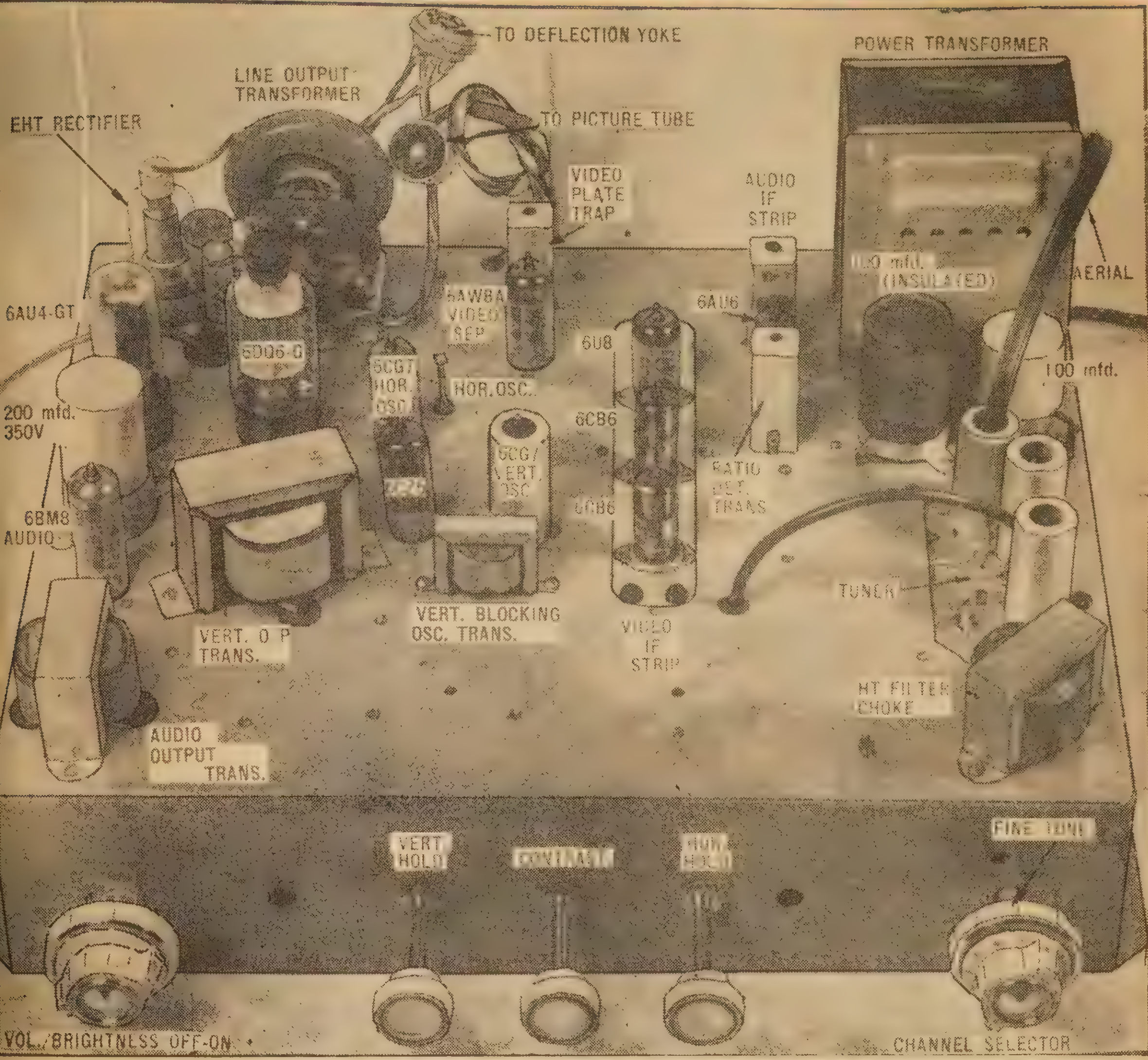
Ask our distributors for a demonstration and full technical data.

Australian National Distributors:

Simon Gray Pty. Ltd.

28 Elizabeth St., Melbourne. Phones: MF 8211, 8166.

TOP VIEW SHOWS ALL THE MAJOR COMPONENTS


TO DEFLECTION YOKE
POWER TRANSFORMER
LINE OUTPUT TRANSFORMER
EHT RECTIFIER
TO PICTURE TUBE
VIDEO PLATE TRAP
AUDIO IF STRIP
100 mfd. (INSULATED)
AERIAL
6AU4-GT
6AWBA VIDEO SEP
6AU6
6U8
5DQ6-G
6CG7 HOR. OSC
HOR. OSC.
100 mfd.
200 mfd. 350V
6CB6
6CG7 VERT. OSC
RATIO DET. TRANS
6CB6
6BM8 AUDIO
TUNER
VERT. BLOCKING OSC. TRANS.
VERT. O P TRANS.
VIDEO IF STRIP
HT FILTER CHOKE
AUDIO OUTPUT TRANS.
VERT HOLD
CONTRAST
HOR HOLD
FINE TUNE
VOL./BRIGHTNESS OFF-ON
CHANNEL SELECTOR

his top view of the chassis, with EHT cover removed, shows all valves and major components. When the photograph was taken, we vere using a 100 mfd. final filter capacitor but a 200 mfd. can be substituted to give better HT filtering. Note the spare holes in the chassis front for use if the chassis is to be mounted vertically.

d groups, in the past, have adopted the and H designs as projects for their embers to build and later own.

If you can't count on such advice and sistance, then make sure that you buy ur parts from some firm with technical cking who can assist, for an extra fee, you do get into strife and who can gn the video IF strip. It can be a her poor bargain to save a few shillgs, if the vendor is only interested in tting your money and seeing you out door!

The chassis measures 13½in x 17in d both chassis and EHT cover should available almost immediately through de supply houses. Alternatively, if u want to make your own, blueprints ing details of the metalwork are available from our office, or posted, at 12/6 the two.

The receiver can be built up, as illusted, with the tube supported above chassis on brackets. In this form is easy to test and adjust, since it can be withdrawn as a unit from the cabinet and operated on its side.

If you prefer it, however, the tube can be hung in the cabinet, and the chassis pushed in underneath it in the same relative position.

As an alternative, the chassis can be mounted vertically against the side of the cabinet, on the right-hand side of the tube, as viewed from the front. This will put the tuning knobs at the top right-hand corner of the cabinet, with the others in a vertical line below it.

Additional holes have been drilled in the chassis front to allow a more logical sequence of knobs, if this is done. The suggestion is that the Volume/Brightness potentiometer be moved into the vacant hole adjacent to the tuning spindles, the Horizontal Hold being moved into another vacant hole adjacent to the original Volume/Brightness control position.

In a vertical cabinet, the knobs will then occupy positions relative to their importance in everyday use.

The position of the major components on the chassis will be clear from the photographs. They have been arranged to allow the picture tube to sit well back on the chassis and, in fact, it can go even further back than shown.

In arranging the layout this way, we have assumed that the chassis will push well forward, against the front face of the cabinet.

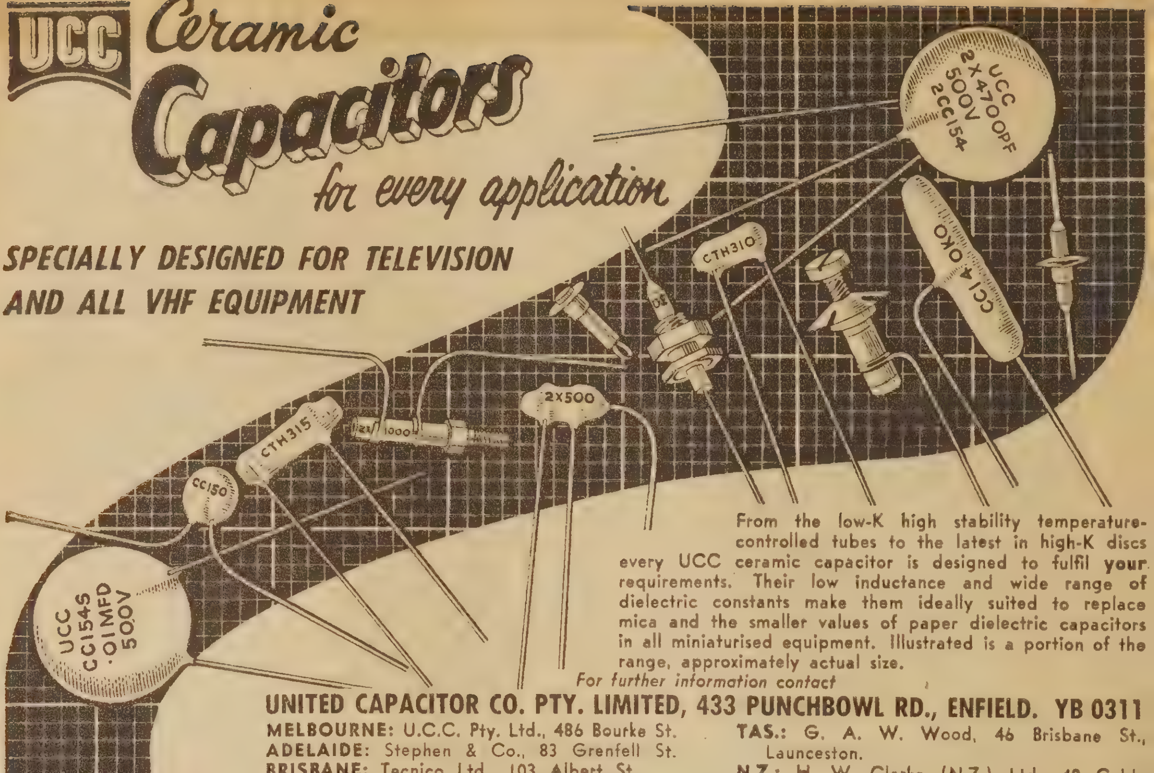
This being so, the control spindles will not need to protrude very far and the tuner has been mounted accordingly. The tip of the tuner centre spindle protrudes 2in from the chassis face and the tandem potentiometer can well be purchased to the same dimension.

The other shafts can, of course, be cut to any appropriate length.

We have planned for a "Q-Plus" tuner, on this occasion, because it fits in very nicely with our requirements. It is also designed to match, in terms of output

UCC Ceramic Capacitors for every application

SPECIALLY DESIGNED FOR TELEVISION AND ALL VHF EQUIPMENT



From the low-K high stability temperature-controlled tubes to the latest in high-K discs every UCC ceramic capacitor is designed to fulfil **your** requirements. Their low inductance and wide range of dielectric constants make them ideally suited to replace mica and the smaller values of paper dielectric capacitors in all miniaturised equipment. Illustrated is a portion of the range, approximately actual size.

For further information contact

UNITED CAPACITOR CO. PTY. LIMITED, 433 PUNCHBOWL RD., ENFIELD. YB 0311

MELBOURNE: U.C.C. Pty. Ltd., 486 Bourke St.
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PERTH: O.F. Gamble, 931 Hay St.
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AT LAST!

A Complete Kit to Build Yourself

With a SCREWDRIVER and a TACK HAMMER This Handsome, Contemporary-styled

VENTED ENCLOSURE

for the ROLA 8MX Extended-Range Speaker

Ideal for Stereo, or as a Superb Extension Speaker.

This enclosure was developed especially by the Rola Company to obtain peak performance from the amazing 8MX . . . yet it requires less than 2ft of floor space!

(See technical review, page 91, "R. T. and H.", June, 1959).

Anyone can assemble this enclosure to professional standard as illustrated, from the S. S. C. 8MX Pack, USING MERELY A SCREWDRIVER AND A TACK HAMMER! You can then stain and polish it to your individual taste.

The complete Pack conforms in every detail to the specifications set out in the Rola Vented Enclosure brochure and comprises matched cabinet veneer panels; oregon frame members; specially milled moulding and fillets; "Sarlon" de-luxe plastic grille cloth and damping felt cut to size; Brent Ware brass-ferruled legs. All timber is precision-cut, drilled and countersunk where necessary; all screws, glue etc. supplied, together with Easy-to-follow Instructions. 8MX Speaker in separate sealed carton is included in Pack.

Maple or Mahogany veneers.

Free Delivery — Cash with order or C.O.D. — in Sydney Metropolitan Area. Country and Interstate: Cash with Order, freight forward to any attended Railway Station.

PRICE:
£15/7/6

Complete with 8MX Speaker

(Kit only, without Speaker—price on application.)

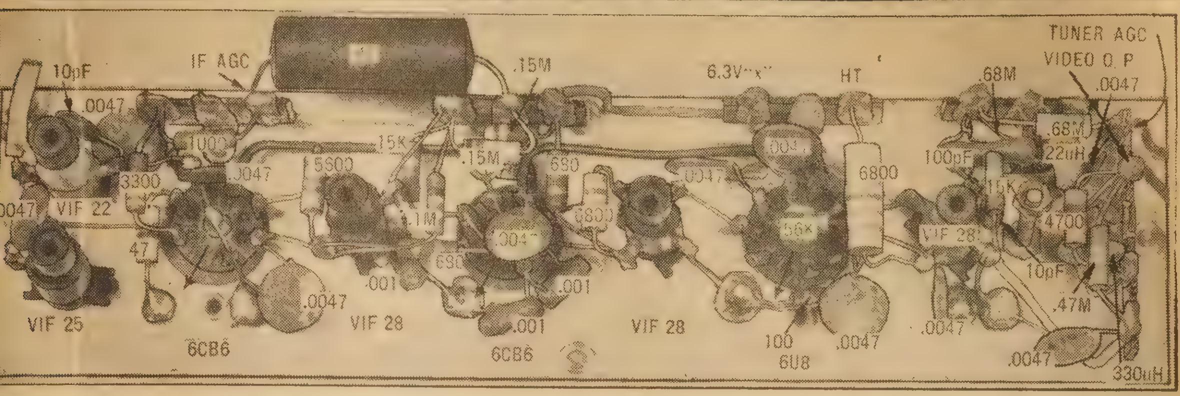
SATISFACTION GUARANTEED OR MONEY REFUNDED.

Available only from:

Telephone Enquiries: 47-2145.

STEREOPHONIC SALES CO. — Box 4777, G.P.O. Sydney

WIRING DETAILS OF THE PREFABRICATED IF STRIP



Here is a detailed underneath view of the prefabricated and prealigned "Mark V" IF strip. Input from the tuner comes in at the top left, while video output and tuner AGC are available from lugs on the right. The entire detector circuit is normally shielded (see main under-chassis picture). Note the bolt, which we added (see text) to make the shield more readily removable. Arrows indicate the position of the blank pin position on each socket. Sub-assembly measures 8 x 2 inches.

ıpedance, the prefabricated IF strip of e same brand.

We have not had opportunity to exam- e the implications of using other makes tuner although they cannot, by any eans, be ruled out. Some would be uch less convenient to mount and dif- rences could be expected in the H.T. pply circuitry.

We do not, at this stage, recommend ıy form of home-built tuner or anything hich might be regarded as a technical nakeshift."

The "Q-Plus" tuner has four holes on p for mounting, which can be tapped 8 Whitworth or 5BA, or simply receive ıall self-tapping screws. To remove e tuner involves disconnecting input ıd output cables, four soldered connec- ons and undoing four screws — a mere o or three minutes' work.

F AMPLIFIER

The IF strip used in the prototype ıassis is another new "Q-Plus" product, "Mark V" pre-assembled and pre-align- l unit. It contains three video IF ampli- er stages plus two germanium diodes, ıe for video detection, the other for GC.

In releasing this simplified strip, the aker's contention is that it represents e one section which is critical as far homebuilders are concerned; further, at there is no great difficulty in build- g and aligning a sound IF amplifier, that overall costs can be reduced by aving this much to the individual con- ructor.

Since the "Mark V" strip is a new oduct, there may be some slight de- ys but it should be possible, in due ourse, for homebuilders to buy the re- vant components and wire up an uivalent IF strip for themselves.

With this thought in mind, we have produced a detailed, coded photograph the original strip, so that it can be ıplicated without too much difficulty. Note that miniature components are ed throughout and that all capacitors her than the AGC time-constant by- ss are ceramics. The placement of l active leads is critical and any re- nerative effects due to incorrect wir- g may prevent proper alignment, even ey do not promote active instability.

Circuit details appear in the main dia- am. A point to note is that the first o stages are wired in series as far as DC is concerned.

Though involving some extra decoupling, it does allow the strip to operate from higher voltage at lower current. It thus becomes possible to operate the tuner and IF strip through a common low wattage decoupling resistor and obviates large voltage swings which otherwise occur with variations in AGC bias.

Another point of note is that the third stage uses the pentode portion of a 6U8, giving a "spare" triode section. The difference in cost is very slight but the spare triode is available as an AGC clamp tube if you should decide, at any future date, to elaborate on the present simple AGC system.

The design calls for a small shield box over the detector assembly. In the original strip, this was soldered in position but we modified this arrangement for our own convenience.

The shield was removed and a hole drilled through the assembly plate and through the shield in a corresponding position, clear of components and wiring. A long bolt was locked to the base plate with a washer and nut. The shield could then be slipped in position or removed at will, being retained by a second nut.

WILL NEED ALIGNMENT

If you build your own IF strip, it will naturally have to be aligned, preferably after final assembly into the chassis and in association with your own particular tuner.

If you have no private facilities for having this alignment done, we can only give the same advice as on the last occasion — buy your parts from a supplier who can offer a subsequent alignment service.

The problem is less critical with a prealigned strip, because manufacturers claim that such a strip can be associated with the recommended tuner and receive pictures directly.

Our experience has confirmed this but it has also indicated that the curve so obtained is seldom optimum, being affected in particular by the relative setting of the slugs in the tuner output coil and the input transformer to the strip. Again, we can only suggest that you negotiate ahead for a final "touch-up" of the alignment on the finished chassis.

The AGC system controlling the tuner and IF amplifier is the same simple, dual system which was evolved for the 1958 receiver.

It could certainly be elaborated for special conditions but only at extra cost. Our experience has shown that the circuit, in its present form, is satisfactory in all but exceptional circumstances and, where cost and simplicity are at stake, it is better to treat these special cases as such.

Wiring of the sound IF amplifier presents no particular problem; neither does the alignment. We shall say more about it later.

In passing, it should be mentioned that a 6U8 could also be used in the sound IF amplifier in place of the 6AU6, thereby gaining another "spare" triode. In fact, two 6U8 triodes would probably make a quite adequate audio amplifier for a portable receiver, allowing the present 6BM8 to be deleted and still further reducing the valve complement.

OLD TYPE STRIPS

One of the problems we anticipated in laying out the new chassis, was that many readers might want to use one of the older IF strips, having much larger overall dimensions but containing the sound IF system and, in many cases, four video IF amplifier stages.

While a new design cannot reasonably be prejudiced to take account of obsolescent components, we did manage to keep vacant the chassis space which would be necessary to accommodate a 10 x 4in sub-chassis.

Its use would involve making a large cut-out in the main chassis, perhaps raising the picture tube slightly and providing a suitable H.T. supply system but, at least, the possibility is there. In terms of performance, of course, some of these older IF strips are excellent.

Signals from the ratio detector pass to the audio amplifier, which uses a 6BM8 triode-pentode, in exactly the same circuit arrangement as used in earlier receivers.

The power supply represents a complete departure from earlier practice. Two silicon rectifiers in a voltage-doubling full-wave circuit replace the original 5AS4 thermionic rectifier.

Elimination of the heater current, higher rectification efficiency and simplification of the transformer allow this latter to be much reduced in size, weight

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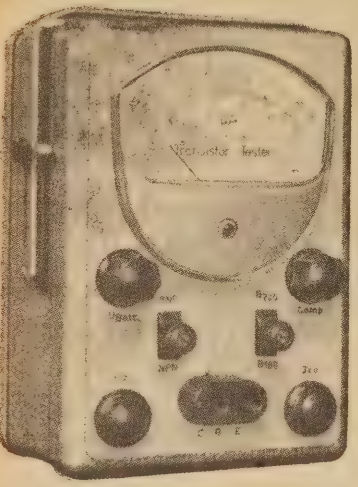

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cost. It now has only a single, apped HT secondary and a winding supply the heaters.

'wo input filter capacitors are re- red, one of which has to be an in- ated type, with both connections act- in respect to chassis. The proper nponent for the job has a cardboard eve which prevents accidental con- with the can and also comes be- en it and the mounting clip.

he filter choke is the same inexpen- type of component as used in the receiver. The current may exceed 285mA rating of some types, but is not likely to cause any trouble

DUCING HUM

Ve had no trouble in the original re- er from magnetic deflection of the m, but there was some evidence of ve in vertical lines, with the initial uitry, when the mains were off fre- ncy. We took time off to investigate effect, using a rather novel method. his involved injecting hum artificially series with the HT supply to particu- circuits, by using an isolating trans- mer and audio generator adjustable he 50 to 100 cycle region.

Jsing a generous 2-volts of simulated 1, we were able to observe a defin- side-to-side weave in the raster due injection into:

1) The video amplifier plate circuit y bad);
2) The synch. separator plate (not- ble);
3) Synch. amplifier plate (barely ceable);
4) Synchroguide control triode plate ely noticeable);
5) Horizontal oscillator plate (bad);
5) Horizontal oscillator grid (bad).

t was clear enough from this that the ical weave was a cumulative effect that its correction would involve er much more generous filtering of H.T. line or else decoupling for the e stages involved. (This may be a it to note in existing receivers where 1 trouble is encountered).

1 the new receiver a 270-ohm resis- and 50 mfd capacitor reduce the ve to a degree where it can only be discerned by looking critically est patterns when the mains are well frequency.

f you want to remove all trace of spend a few extra shillings and use arger final filter capacitor.

WER TRANSFORMER

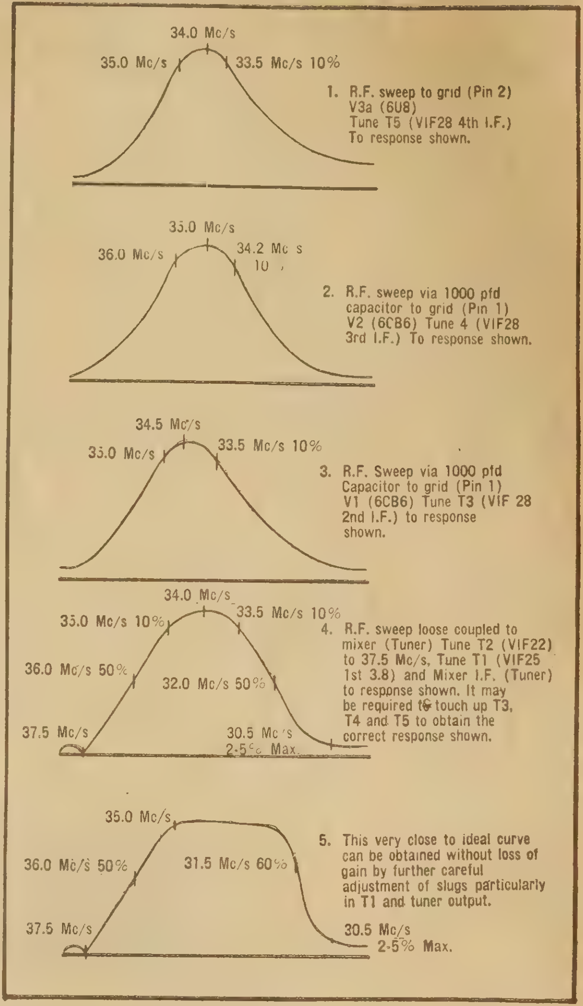
he power transformer used in the inal receiver has a 12.6 volt 10-amp ter winding, with a centre-tap for nection to chassis. One side of each e heater can therefore be earthed the socket and the other pin taken the appropriate end of the winding, ked as "X" or "Y."

Ve have coded the circuit in a way ch will distribute the load and also group the high level deflection am- ers. If, for any reason, you want ender these stages inoperative, while king on the rest of the circuitry, one en heater wire will do the trick.

or the video amplifier, we have used pentode portion of a 6AW8. In some ects the circuitry follows earlier prac- but we have elected to use direct oling on this occasion, thus preserv- the DC component. This has neces- ed bleeding the video plate down to volts maximum to conform to heater- ode ratings on the picture tube; hence network of plate resistors.

VIDEO IF ALIGNMENT CURVES

The first four curves are copied directly from the data sheet issued by the manufacturers of the prefabricated IF strip. We were able to obtain very similar curves using ordinary sweep alignment techniques. However, by subsequent careful manipulation of the cores, particularly in the tuner-IF coupling transformers, the bottom curve was obtained. Output was taken from the video amplifier plate through a 0.22 meg isolating resistor.



1. R.F. sweep to grid (Pin 2) V3a (6U8) Tune T5 (VIF28 4th I.F.) To response shown.
2. R.F. sweep via 1000 pfd capacitor to grid (Pin 1) V2 (6CB6) Tune 4 (VIF28 3rd I.F.) To response shown.
3. R.F. Sweep via 1000 pfd Capacitor to grid (Pin 1) V1 (6CB6) Tune T3 (VIF 28 2nd I.F.) to response shown.
4. R.F. sweep loose coupled to mixer (Tuner) Tune T2 (VIF22) to 37.5 Mc/s, Tune T1 (VIF25 1st 3.8) and Mixer I.F. (Tuner) to response shown. It may be required to touch up T3, T4 and T5 to obtain the correct response shown.
5. This very close to ideal curve can be obtained without loss of gain by further careful adjustment of slugs particularly in T1 and tuner output.

☆

The change also involves a variation in the brightness control circuit, which now operates on the picture tube grid.

The inevitable interaction which results between the Contrast and Brightness controls has been relieved to a large extent by deriving voltage for the latter from the video amplifier screen. Since the potential of the screen tends to move in the same direction as the plate, with changes in bias, a good deal of automatic compensation results.

In practice, the constants tend to peg the black level and operation of the controls within likely limits for any given situation is fairly free from ambiguity. In this respect, the receiver is a lot easier to control than many we have seen using direct coupling or DC compensation.

As mentioned previously, the triode section of the 6AW8 serves as a synch. separator. This is not in any sense a compromise over the earlier scheme of using a separate 12AU7. With a slight change in constants (see circuit) the high-mu triode is marginally better than the 12AU7, while the layout definitely benefits from not having to be grouped around a single socket.

The differentiating and integrating networks follow, as before, leading to a second triode which is now "spare" in the 6CG7 vertical oscillator. Here again, no sacrifice in efficiency is involved.

While checking on the operating conditions for these two triodes, certain points came to light which have a bearing on this same type of synch. separator, used last year.

The two resistors supplying the separator are intended to peg the voltage at a low figure such that the valve can be cut off readily by the incoming synch. pulses. However, these two resistors also determine the amplitude of the signal applied through the networks to the following grid.

If the signal amplitude is too high or the attenuation through the networks rather less than anticipated, by reason of component tolerance, the synch. amplifier runs into overload and tends to intermodulate afresh the line and frame pulses and the residual video which will be present but normally below interference level.

UNDESIRABLE EFFECTS

When this happens, horizontal pulses are attenuated near the vertical block and top-of-picture bend becomes evident. Simultaneously, the ratio of synch. to video reduces and subject movement near the right hand edge of the screen can cause a shift in the raster.

Thus, while certain values can be specified in this circuit and the previous one, there is no guarantee that the exact operating conditions intended will be achieved in all cases. It is quite in order, therefore, to reduce slightly the resistor between the synch. separator plate and earth if trouble is encountered.

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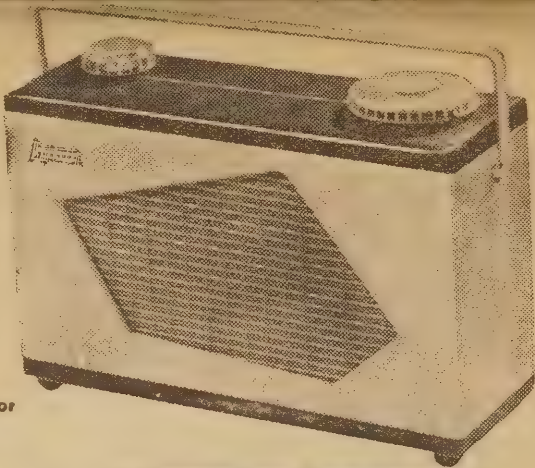

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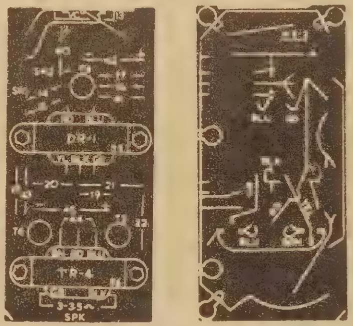
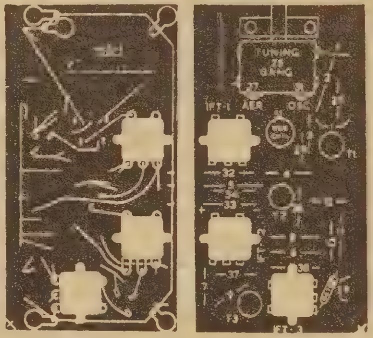


WB2 Silk-screened Wiring Board: topside and underside.



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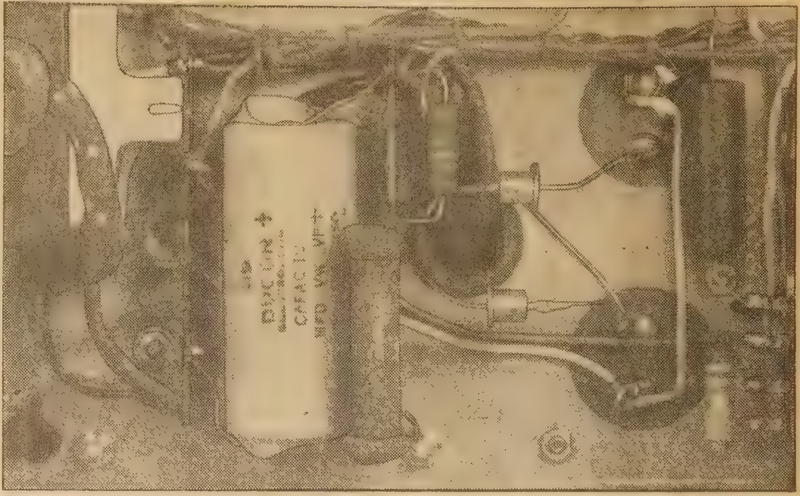
POWER SUPPLY WIRING DETAILS



Here is a close-up view of the power supply wiring, most of it anchored to two 8-tag strips. The fuseholder is at the left, while the rear face of the tuner can be seen at the right. Near the tuner are the two 100 mfd input filters and, connecting them, the two silicon rectifiers.

this receiver the resistor is shown 39K. Undue reduction will, of se, reduce synch. amplitude generally prejudice picture locking.

is noteworthy that a space has been between the 6AW8 and the 6CG7. is space it would be possible to fit ated pentode separator-cum-AGC without disturbing the rest of the ut.

e requirements of 110-degree deflec- are such that it is no longer feasible se a simple triode vertical amplifier, ating from the B-plus boost circuit. design therefore provides for a er pentode in the vertical output .

DBACK CIRCUIT

uch of the relevant circuitry is taken ght from application data issued by valve and component manufacturers. rather complex feedback network een the vertical output plate and cal oscillator has been devised by with three main requirements in :

To achieve adequate linearity in inal scan, as viewed on the screen.

To make the circuit as independent ossible of valve and component tions.

To minimise penetration by hori- al pulses which could affect the ver- oscillator and upset interlace.

e actual layout of the components wiring in this part of the circuit will etailed in a later issue.

nilarly, the horizontal circuitry is d on manufacturers' recommenda- and, naturally enough, uses com- nts which are expressly designed for legree deflection. They are manu- red locally by A.W.A. and are sold r the brand "M.S.P." (Manufac- s' Special Products).

Intending constructors should te that yokes and output trans- mers intended for 70 or 90- gree deflection cannot be substi- ed for the 110-degree types in s receiver. Similarly, other brands components, though intended for)-degree receivers, should not be stituted unless they are specified electrically identical and inter- ngeable with the M.S.P. types.

making this statement it is not in- d to infer that other components n any way inferior to those speci- d It is simply a matter that different of components require different t arrangements and they are not ore interchangeable in any given er.

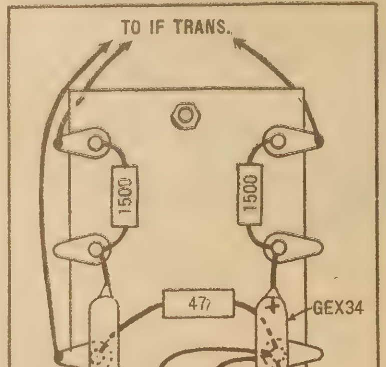
PLER LAYOUT

e physical layout of the horizontal tion and EHT circuitry has been y simplified as compared with our us receivers. The components are ted directly on the main chassis, above, some below. They are all y accessible. Experience has shown his "open" approach is permissible, led the "hot" deflection circuits are ed together and away from the f the wiring.

simple cage on top of the chassis es the horizontal output trans- r and the smaller components are intimately associated with it. e same time it would be possible d another shield bracket beneath assis, enclosing the horizontal out- damper diode and EHT rectifier s, as well as the width and linearity coils and other small components associated with them.

While the layout was deliberately plannned to make this possible we have not specified a shield as a standard fitment.

Various subsidiary controls and devices are ranged along the rear edge of the chassis. The width and linearity coils are apparent from the under photograph. While the slug adjustments are very handy in the positions shown they are also very vulnerable and it would seem a wise precaution to protect them with some sort of a removable hood bent from aluminium scrap.



The entire ratio detector circuit is mounted on a standard panel board, with five lugs on each side. Wiring of the amplifier valve and associated transformers will present no difficulty.

Focus, height and vertical linearity potentiometers are likewise mounted on the rear of the chassis. We used conventional types cut down, because they were ready to hand, but tab types would be cheaper, if you can get them. Note that the linearity potentiometer should be a wire-wound type, because of the current drain involved.

We have left room for yet another pot. in the group, in case a more elaborate form a A.G.C. is desired, involving a preset adjustment. This is yet another provision for possible individual expansion of the design.

On the rear face of the chassis and just near the E.H.T. rectifier is a speaker socket. This socket is often placed nearer the front, purely for use with an internal speaker but the position suggested will facilitate connection to an external speaker system, if you should have ideas along this line.

FUSE HOLDER

In the corresponding position at the other end is a drawer type fuse holder, again marketed by M.S.P. A 3A. fuse will provide some safeguard for the rectifiers in the event of an H.T. short.

In describing the construction of the receiver, we plan to give you enough, this month, to hear the sound side of the programmes. If facilities are available, you can go further and align the IF channel (or rather channels) and check the operation of the video amplifier.

As a first task we suggest that you mount most, if not all, the valve sockets, taking particular care to see that they are orientated as in the original chassis. Be guided by the position of the pins rather than the mounting holes, since the relationship of the two seems to vary with the brand of socket. If you have to drill a few new mounting holes, do so rather than tolerate inefficient wiring.

One heater pin in each socket will need to be grounded and it is a good plan to slip solder tags in strategic positions under the mounting bolts. Then the heater pin, the centre spigot and any

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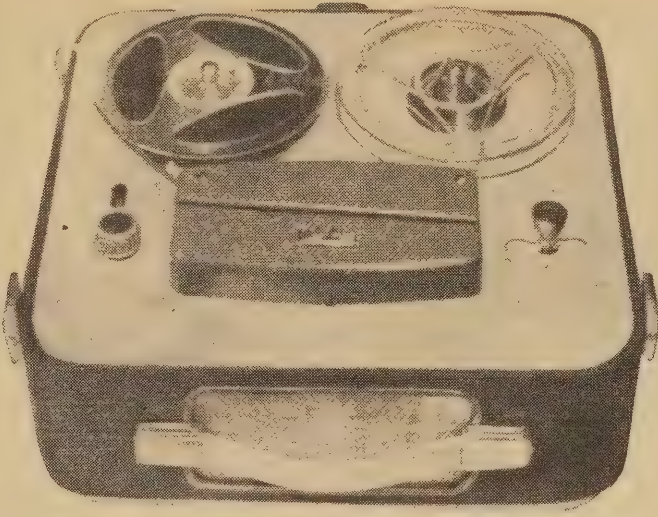

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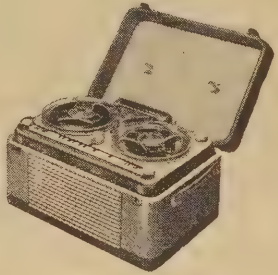

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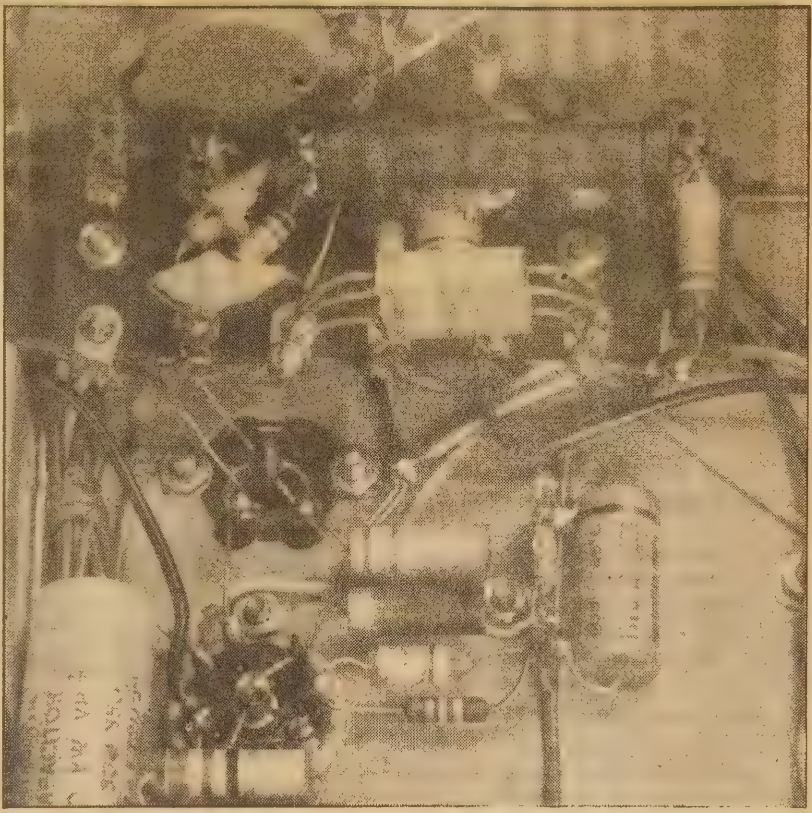


This close-up photograph shows the wiring of the 6AW8 video amplifier. The socket is at bottom left with the 5.5 Mc trap above it. The panel carries plate components while those feeding the synch. separator attach to the tagstrip.

pin that you can pick out as need- be earthed can be linked to the st lug with tinned copper wire.

don't trust to a single lug or a bolt for a permanent contact to nassis. The metal surrounds used ost sockets these days will generally two mounting bolts automatically. power transformer can now be in position and the power supply begun. As shown in the close-up graph most of the power supply terminates on two eight-tag strips, incidentally, need to be mounted the transformer is bolted down. tagstrip nearest the rear of the s provides the following connec- counting from the side of the s: (1) common; (2) earth; (3) (4) 240V; (5) 250V; (6) 6.3V; (7) CT, earth; (8) 6.3V.

incoming mains lead connects to non" and "earth," but the remain- tive wire should be wired through iseholder, then through one section e "off-on" switch on the volume/ ness pot, then back to the "240V" nal.

ke sure to tie the lug providing the CT earth to at least two other ent earth points. Something like nps of current are flowing in this t.

OND TAGSTRIP

nnections to the second tagstrip, in order from the side of the is, are as follows: (1) HT secon- thence to one side of the 5-ohm or; (2) earth; (3) HT secondary. e to filter capacitors; (4) 5-ohm or and rectifiers; (5) B-plus 260 nal and 270 ohm resistor; (6) blank; rth; (8) B-plus 250 supply point.

en wiring the rectifiers and filter itors, be extremely careful about ty, since a mistake may cost you more components at first switch- There may be some point in not g the 5-ohm resistor at this stage. a somewhat larger value can use- limit the voltage while you are the preliminary sections of the er.

er the power supply a logical next s to wire in the audio system, and hould be a simple task in the light e accompanying photograph and m. Remember, however, to make the primary or the secondary con- ns of the output transformer temporary, so that it can be phased for negative feedback.

Actually, there is no reason why this should not be done immediately on completion of this much of the wiring. But don't risk your electrolytics and rectifiers by allowing them to operate a full voltage with so little drain. As a precaution, change the transformer primary lead over to "250V" and use any 3-watt resistor (or larger) you may have of, say, 50 ohms, in place of the 5-ohm type which will ultimately be required.

The normal voltage on the HT line is 260 volts.

If the volume control and speaker is connected, the audio amplifier can be checked and then forgotten till you want to use it. The amplifier will probably howl when the feedback circuit is completed, if the feedback happens to be positive. Negative feedback, on the other hand, will reduce gain as evidenced by how much noise it makes when touching the input potentiometer lug.

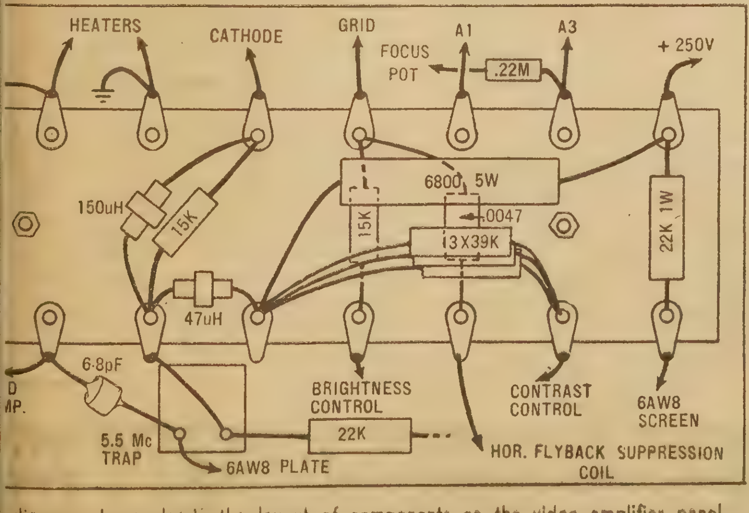


diagram shows clearly the layout of components on the video amplifier panel. Leads to the picture tube terminate on the upper edge.

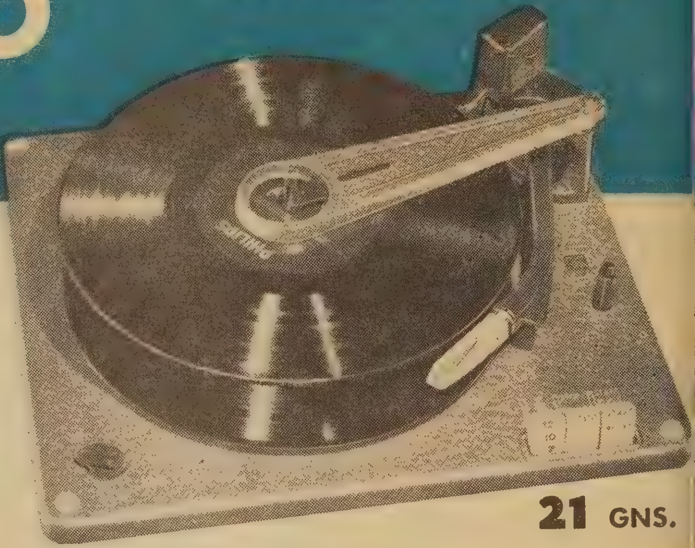
TUNER SUPPLY

The tuner supply components can well be added next, using a 5-tag strip near the front corner of the chassis, under the filter choke. The end lug nearest the side of the chassis is for B-plus 260V, the supply resistors bridging to the other end, which is bypassed to earth with a 16mfd. electrolytic. This becomes the HT supply point for the tuner, and both IF amplifier systems, video and audio.

If you tap the mounting holes of the tuner, make sure that the metal powder does not fall down into the "works." Check to see that the shafts pass freely through the chassis clearance hole before securing the tuner in position. Add the supply leads, which are in order, from the side of the chassis: (1) B-plus, (2) Osc. B-plus, (3) Heater, and (4) AGC. Note that the oscillator supply resistors connect directly between lugs (1) and (2). To give a margin on wattage rating, we have specified two parallel resistors in the circuit, though only one appears in the photograph.

PHILIPS STEREO

Record Changers and Record Players



21 GNS.

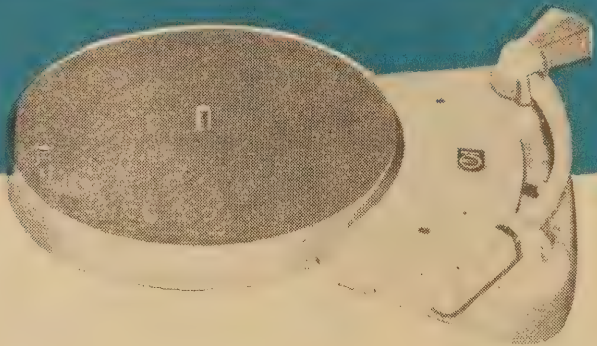
TYPE NG1020

Triple-Function STEREO Record Changer

Now produced specifically for stereo operation, the popular Philips push-button record changer fulfils the exacting demands of this exciting new development in record reproduction.

- Two separate plug-in high-fidelity pick-up heads:
  L.P. and Stereo type AG 3063;
  78 r.p.m. type AG 3066.
- Plays all types and sizes of records—Stereo, L.P., 78, 45, 33⅓, 16⅔.
- Push-buttons for easy operation.
- Smooth, silent, wow and flutter free, absolute minimum rumble.
- Three separate functions.
  1. Fully automatic changer—loads up to ten records.
  2. Automatic single play. Single records may be placed directly on the turntable.
  3. Manual single play.

PHILIPS



TYPE NG1009

A.C. Player with Stereo Counterweight and Stereo Pick-up Head

A pick-up arm counterweight is now available as an accessory for the popular Philips four-speed record player. With the stereo pick-up head plugged in, the counterweight reduces the needle pressure to the correct amount for playing stereo recordings. This removes the need to use inaccurate spring devices and the unit provides a compact stereo player for the widest applications.

NG1009—A.C. player with standard twin stylus pick-up head	**£10-9-0**
AG3063—Stereo pick-up head	**£2-7-6**
NG1023—Stereo counterweight	**10-6**
Mounting plate	**15-6**
NG1012—6-volt battery-operated version of record player	**£13-5-0**

P1651 59

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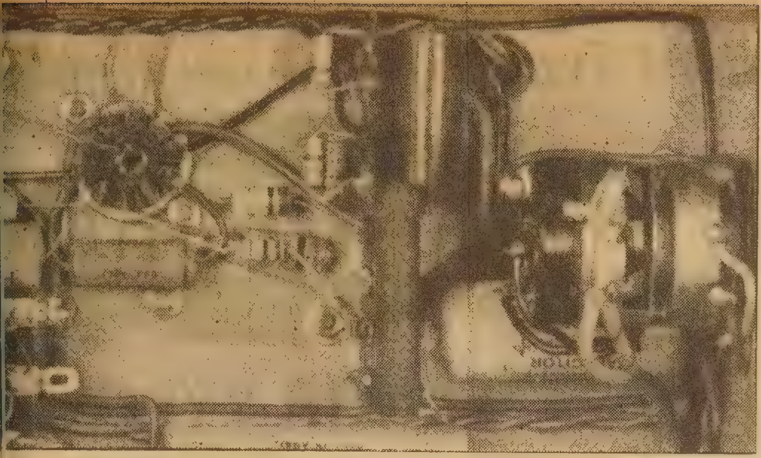

complete audio amplifier is grouped in one corner of the chassis, adjacent to the Volume/Brightness control. See also diagram below.

e tuner, past the power transformer then down through a hole in the is to screw terminals on the rear Some tuners include an IF filter can alongside the valves; more re- it has been omitted as un- rtant.

tput at IF is conveyed from an on top of the tuner, down through e in the chassis to the input lug of F strip.

explained earlier, the IF strip was nplete prefab. unit which we simply ned from the manufacturer and directly into the chassis. If you kewise, either make the detector removable or else take the precaution of soldering leads beforehand to the "video output" and "tuner AGC" lugs at the rear end.

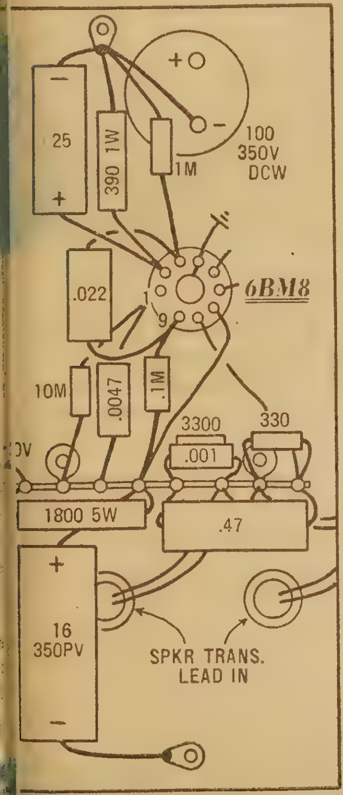

diagram shows the grouping of onents around the audio amplifier, being anchored to an 8-tag strip.

Based on past experience, many constructors will want to build up this strip for themselves and while we cannot write a "this-is-how-you-do-it" article we have included a detailed picture of the original, so that it should be possible to just about duplicate it, wire for wire.

If this is done carefully, using identical components, results should likewise be identical.

The sound IF amplifier should present no difficulty and the position of the two relevant coils and the valve should be apparent from the photograph. The entire ratio detector circuit can be pre-assembled on a panel having five lugs per side, with one additional earth lug under the mounting bolts.

The panel, along with several others, can be pre-assembled and then mounted in the chassis on ¾-inch plastic pillars. These are standard items, as also are the 1-inch by 1/8th Whitworth bolts, to go through them.

Here again there is space on the chassis to accommodate a more elaborate sound IF amplifier. Thus, if you are not keen on the idea of taking sound from the video amplifier, an extra hole can be punched and the ratio detector moved back to allow for a two-stage IF system operating directly from the video detector.

VIDEO AMPLIFIER

Before the audio system can function in the form specified, it is necessary to wire the video amplifier. Here again, a detailed photograph and sketch has been included to make the job easier. Note that the lugs of this panel have been bent upwards to give better clearance and accessibility.

The lugs to the rear of this panel provide terminations, in order, for the wires running up through the chassis to the base of the picture tube. Except for the cathode lead, these wires can be twisted into a cable about a foot long (i.e. above the chassis) and the easiest way is to wire them to the panel before it is mounted in position.

You may not want to attach the picture tube socket till later, so just bind up the wire ends to prevent accidental shorts while you are testing the sound circuits.

The one component not obvious from

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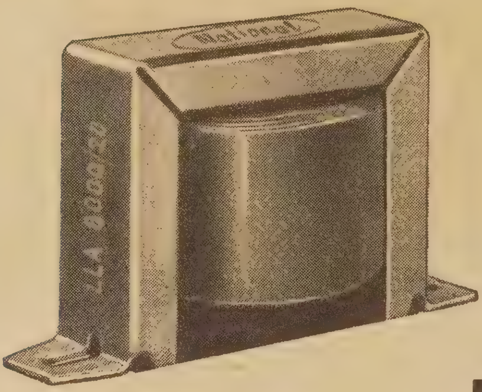

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DRIVER Type LLA 8000/20	
Primary Impedance	8000 ohms
Primary D.C. Resistance	266 ohms
Secondary Impedance	20 ohms
Secondary D.C. Resistance	1.3 ohms
Efficiency	90 p.c.
Frequency Response	50-15,000 cycles ± 3 dB

OUTPUT Type LLA 20/35, FB	
Primary Impedance	20 ohms
Primary D.C. Resistance	0.42 ohms
Secondary Impedance	3.5 ohms
Secondary D.C. Resistance	0.13 ohms
Feedback winding Turns Ratio Prim/FB	4.6:1
Efficiency	95 p.c.
Frequency Response	± 3dB 100-15,000 cycles
Nominal Power	3 watts

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		PRIMARY	SECONDARY		
FLA 375C/3.5	OUTPUT	375 CT	3.5	500 m Watts	90 pc.
FLA 300C/3.5	OUTPUT	300 CT	3.5	500 m Watts	90 pc.
FLA 3000/1300C	DRIVER	3000	1300 C.T.	—	90 pc.
FLA 3000/2000C	DRIVER	3000	2000 C.T.	—	90 p.c.

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lrawing is the 22-ohm cathode re-. This is actually mounted on the wo lugs of a 2 x 6-tag panel carrythe synch. separator components. end of the resistor links to cathode o the screen bypass, while the other ects to the shielded lead running e contrast control.

e same point is bypassed to an ent earth lug with the 68pF capacipecified in the circuit.

all diameter, low capacitance coax. should be used for the run to the ast Control.

e five components mounted to one of the 6AW8 socket can well be l, though they are not essential to ing sound. They serve to convey from the pentode plate to the grid.

suming that all the essential conons have been made, it should be ble at this stage to switch the reon and tune the three television ns. If our experience is any cri-, you will not need to worry overabout an aerial—that is for sound A wet finger, a piece of wire were gh to ensure noises.

atever you do, don't fiddle aimwith the IF slugs, even if you the IF strip has to be aligned Every unnecessary movement s that much more wear.

wever, if you have alignment ies available, the strip can be d accurately using the data reproherewith.

hould be possible to align the last transformers easily enough, using ot frequency method, but the two onnected transformers coupling and IF channel would present the problem.

ND IF CHANNEL

the sound IF, you need nothing than a VT voltmeter and an actual ion signal—preferably rendered by not having too efficient an aerial the VTVM to the 3-volt DC scale ring the pointer to mid-scale with ero-Adjust knob. Clip the active o the audio output lug from the detector panel. The meter will bly deflect to one side or the other ur original centre zero.

ig it towards the original centre out not right on it. Then adjust ug in the 5.5Mc. video trap and for any slight increase in the r reflection. This will indicate signal level, and it should be posto find two points of resonance u screw the core into and out of nding. If there is only one point, mean that the coil is not reaching , and a small additional shunt tor (up to 10pF) may be neces-

ig the same observation, try to a peak also on the coil feeding AU6 and the primary winding of atio detector. Lastly, bring the ary to exact balance by adjusting p slug.

no VTVM is available, a rough ent can be carried out by operate receiver without an aerial, or ed so that the sound signal is as as possible. Adjust the top ratio r slug for best sound quality and noise or frame buzz, then peak ther slugs for maximum sound The peak, if any, will be very because of the very high audio l gain and its inherent rejection plitude changes.

(To be continued)

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NOTE: Type H4 and EH4 are NOT suitable as replacements for other L.B. Products tape heads. the full range of which remains unchanged.

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Ultron 15, 15T, 15L (Record-play high impedance, extra range, .00017in gap)	£9	13	6
Ultron 15H, 15HT. 15HL (Medium impedance, extreme range. .00017in gap)	£9	13	6
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HE2, HE2T, (Record-play, commercial quality. .0002in gap) ..	£6	3	0
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Note: "T" denotes upper half track, "L" lower half track. all others full track (except H4 and EH4, which are half track).
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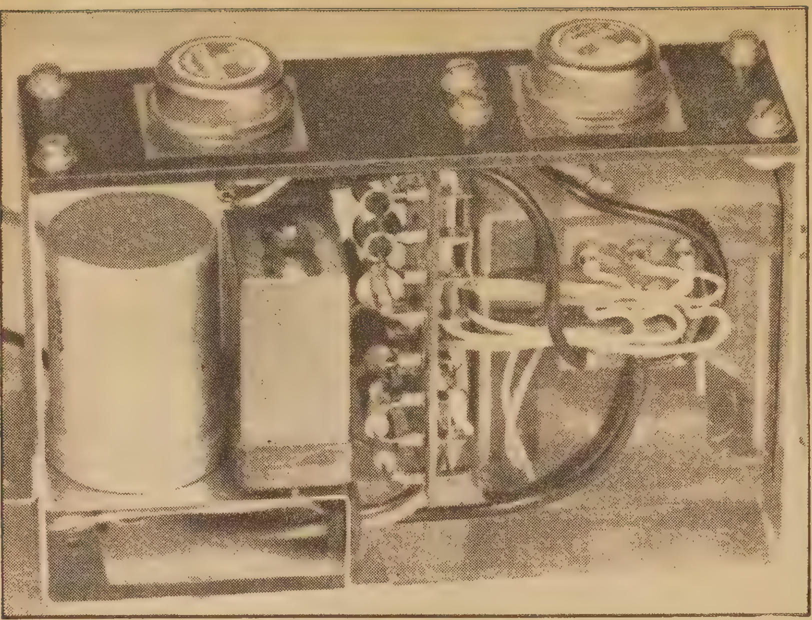


This 30-watt transistor DC to DC converter is described at the end of the article. The main dimensions are only 6in by 4in by 1¾in.

Design Of Transistor DC-DC Power Supplies

Electronic equipment of all types is being operated from portable battery supplies the days. Efficiency and reliability of such equipment can often be improved by the use transistorised converters which convert power at battery potential to the high tension need to operate valves &c. Theoretical background is discussed in this article which goes on describe a practical converter.

THE purpose of this equipment is to convert low voltage DC from a battery source to high voltage DC, suitable for powering portable or mobile electric or electronic equipment, e.g., receivers, transmitters, amplifiers, geiger counters, photoflash units, etc.

Before the development of transistor DC converters vibrator supplies were generally used for lower powered supplies and genemotors where larger amounts of power were needed. The new development has the advantages of better efficiency and greater reliability because of the absence of mechanical moving parts. Noise and vibration are greatly reduced.

ENCAPSULATION POSSIBLE

Static components make it practical to hermetically seal or encapsulate a transistor DC converter, making it completely independent of external pressure and humidity.

Size and weight, both, of the transistor converter are usually half or less that of the equivalent vibrator or genemotor supply.

By J. B. GOODMAN

(Ducon Condenser Ltd.)

The principle of operation is basically as follows: A power transistor is connected in an inductive feed-back circuit in such a manner as to cause a swit action. Usually two transistors are in a push-pull circuit, with the oper of one transistor triggering the se and vice-versa. However, this mo not essential and a number of singl converters ("ringing choke") have designed and built by various peo

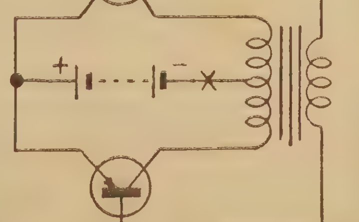


FIG. 1

The ringing choke converters hav vantages where simplicity and high ages at low power are required. ever, they suffer from poor regul with respect to change in load cu and, therefore, are generally less than the push-pull transformer co arrangement.

The power output available from fractions of a watt (geiger cou to hundreds of watts (mobile trar ters).

The components of a converte suitable power transistors, a feed transformer which may or may n clude an output winding, a startin despiking network, and a rectifier circuit.

It is proposed to consider only pull transformer converters in this Information on ringing choke conv can be read elsewhere (Biblio. 2,4).

TRANSISTOR CHARACTERIS

Transistors may be operated in basic configurations, namely, co base, common emitter, and co collector. All three configurations be used (Biblio. 1). However, mos verters use the common emitter c The primary current flows in the e collector circuit, using the base a controlling element for starting switching.

Thermal conditions limit the max current that a given type of tra may pass. Each manufacturer in lished data lists this current, an maximum operating temperatures. not proposed to go to any det thermal circuits, as these are a well covered (Biblio. 1, etc.), and, rate, in a good design with conse ratings thermal conditions are of n consequence.

The electrical operation of the discussed first. Consider the fol basic circuit (Fig. 1):

When the battery circuit is com forward bias is applied to the b the transistors by means of a starting circuit (discussed later). T turn, causes current to flow in the tor circuit via the primary windi

Greatest current will flow in primary connected to the transist the greatest current amplification (Beta). The feed-back winding base circuit is connected with a p such that the collector current same transistor rises even furthe the current of the other transi reduced and finally cut off.

Increase in current of the firs sistor ceases only when the m

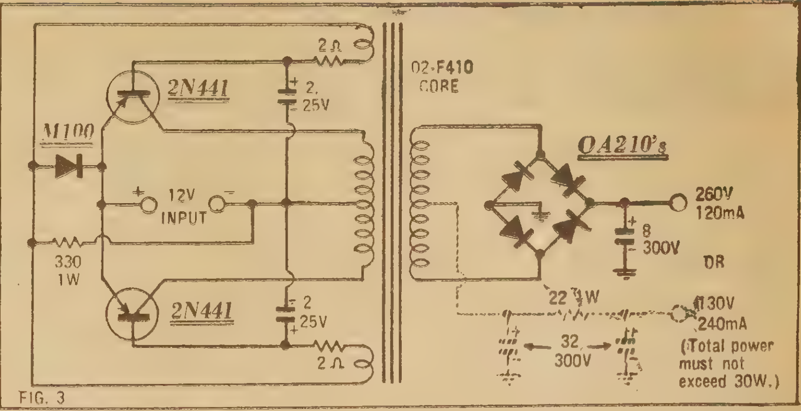


FIG. 3

Circuit of the converter pictured opposite. Power can be drawn from both outlets, but the total must not exceed 30 watts. A fully transistorised modulator would allow a portable/mobile transmitter to operate with power inputs around the 20-watt level.

material is saturated and there is oltage developed across the base ack winding. Collector current will all to a low valve.

gnetic energy stored in the core e released, inducing voltages of ite polarities in both feed-back ng.

lector current of the first transistor nduct will be cut off, the current of cond transistor will increase until ches a value such that the core is ted in the opposite direction. The sing magnetic field causes the ty of all voltages to reverse and cycle begins.

process as described above con- at a frequency determined by the etic circuit constants. The induced e is of essentially a square wave with a spike on the leading edge h conduction cycle. (See Fig. 2.)

rating characteristics of power stors in these circuits take account following parameters, which must nown and taken into account in :

eak voltage (emitter-collector).
aximum collector current.
quivalent saturation resistance (only hen max. collector current is not a miting factor).
ase voltage/collector current, char- teristic.

E CHARACTERISTICS

ideal core material for converters l have the following characteristics, ll of which can be found in any n material:—

1. Low hysterisis loss at complete saturation.
2. High saturation flux density
3. High permeability until saturation.
4. Ability to operate efficiently at high frequency (since fewer primary and secondary turns are required, resulting in a lower copper loss).
5. A toroidal form (minimum leakage, etc.).

hough the ideal material would bly be a nickel-iron alloy toroid HCR), the design which follows uses a ferrite core. The advantage kept in mind by the experimenter winds his own transformers is that imum number of turns is required

type of ferrite core used in TV k EHT generators is generally ble and lends itself to a readily d bobbin, instead of the difficult form.

standard equation for transform- used, having a numerical modification to allow for square wave instead of sine wave conditions.

$$n_p = \frac{E}{4 B f A} \times 10^8$$

where: np is number of primary turns (each half)

E is voltage applied across winding approx. Esupply.

B is saturation flux density of core (gauss).

A is cross sectional area of core (sq. cms.)

f is operating frequency (cps.).

The information included above does not consider starting bias, which is necessary to initiate oscillation. Several systems are in use, the most common being a voltage divider network to feed DC to the base, and a less common but slightly more efficient divider, using a silicon rectifier and resistor. The circuit (Fig. 4) indicates the connection for the divider network.

OPERATING FREQUENCY

The feedback voltage is determined by reading from the base voltage/collector current characteristic (see Fig. 5), the value of base voltage required to pass the required collector current. Add to this the IR drop across starting resistor R1 and base series resistor if used.

The secondary winding is determined by a turns-per-volt ratio for the appropriate secondary voltage required.

There are a number of factors to be considered before deciding the operating frequency. For ease of filtering a high frequency is to be preferred. A high frequency means that fewer turns of thicker wire may be used, so that the copper losses decrease.

Core losses, on the other hand, increase with frequency. They are, however, usually small with ferrite cores.

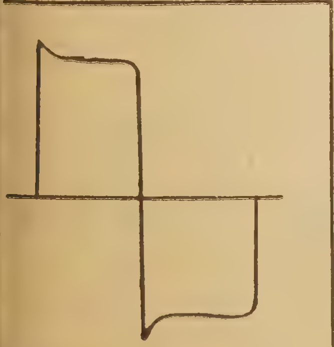
Losses in the transistor also increase with frequency because the maximum dissipation occurs when the transistor is switching from the conducting to the non-conducting state, and vice-versa. The higher the frequency, the greater the number of switching operations. Therefore, for each converter design, there is an optimum operating frequency. In general it is higher for converters with ferrite cores than for the iron cored transformer type.

Typical Design.

Requirements:
30 watt output at 260V.
12 volt input (car battery).
Components:
Delco 2N441 transistors.
Ducon 02 cores (part 410).

Transformer Design.

Given E Supply = 12.6 volts.
B = 4500 gauss (Ducon cat sheet).
A = 1.4 sq. cms. (Ducon cat sheet).
f = 2000 cycles (assumed).



G. 2

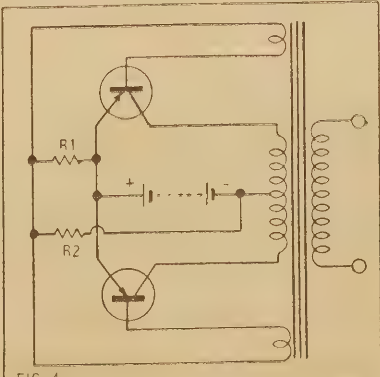


FIG 4

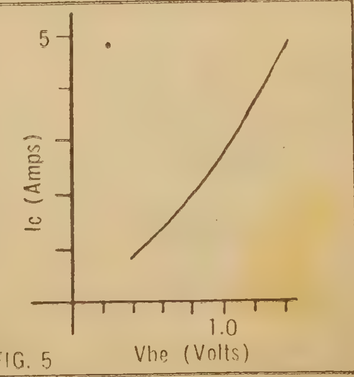


FIG. 5

KITSET SPECIALS

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1. Playmaster Tuner 2
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3. S/W 3 Band 3
4. Portagram (A.C.) 4
5. Batt. Portable 5
6. Batt. Radiogram 6
7. Vibragram 7
8. S/W Converter 2
9. Reinartz (A.C.) 3
10. Dual Wave 5
11. Economy B/C 5
12. Dual Wave 6
13. All Wave 8
14. Skymaster 11
15. Transistor 1
16. " 2
17. " 3
18. " 4
19. "Transporta" 6
20. " 7
21. Transportagram 6
22. " 7
23. Transigram 4
24. Mullard 2-2 Stereo
25. Twin 5 Stereo Amp
26. " 7 " "
27. Twin 10 Stereo Amp
28. " 17 " "
29. Hi-Fi 3 Amp
30. " 5 "
31. Mullard 3.3 Amp
32. " 5-10 "
33. Stereogram
34. 13W. Std. Amp
35. 25W. " "
36. 35W. " "
37. 5in. Wide Range C.R.O.
38. Pattern Gen.
39. Sweep & Marke Gen.
40. V.T.V.M.
41. R/C Bridge
42. M/Meter 1000 ohm/V.
43. M/Meter 20,000 ohm/V
44. 50 MC/S Conve
45. 144 " "
46. Transistor 10W. Amp.
47. Hybrid Car Rad

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$$N = \frac{E \times 10^8}{4 \beta A I}$$

$$= \frac{12.6 \times 10^8}{4 \times 4500 \times 1.4 \times 2000}$$

$$= 25 \text{ turns}$$

nce turns per volt=2 (approxi-
y).

ume the following circuit (Fig. 6):
series resistors, r., are used to
adequate current sharing for both
They are usually made 1/3 of
put resistance of the transistor.
ng a silicon diode as the starting
, with a theoretical voltage drop
volt, the following feedback voltage
nination is made:
a 2N441, Vb-e=0.6V approx.
value of Ic=3 amps. (This value
assumes an efficiency of approx.
and an input of 38 watts). Base
teristics give a value of base cur-
f 0.1 amp. for a voltage of 0.6V,
lent to an input resistance of 6
hence the choice of 2 ohms for r.
s, total feedback voltage required:

= Vb-e + diode drop + series r drop
= 0.6 + 1 + 0.2
= 1.8 volts

Since turns për volt equals 2, use 4 turns for each feedback winding, giving 2 volts of feedback.

The above design procedure will give optimum efficiency with transistors whose characteristics are accurately known. The circuit can be made more tolerant to variations in transistor characteristics, of the same or closely equivalent type, by deliberately increasing the feedback. This does, however, involve a reduction in efficiency. Excessive feedback is not desirable because it causes ringing and increases transistor dissipation.

The resistor R, although able to be calculated, often varies in practice. The best procedure is to start with, say, 1,000 ohms and reduce until starting takes place under all conditions.

Secondary winding equals 260 x 2 equals 520 turns per side.

In order to obtain close coupling and balance, and to avoid spikes of large amplitude, both the primary and feedback windings are wound bifilar, with the start of one primary connected to the finish of the other, this join becoming the centre tap; similarly for the feedback. The secondary winding is conventional.

ONSTRUCTING A TYPICAL DC-DC CONVERTER

the time when experimental work
ommenced during 1958 no com-
l transformers were locally avail-
Toroid winding facilities were also
ilable. As previously noted, the
st solution offering was to wind a
tional bobbin-type winding and
ferrite core available from
General Ceramics Pty. Ltd.

g the design above, the following
gs are required, wound in this

edback 4 plus 4 bifilar No. 24
and S.
imary 25 plus 25 bifilar No. 18
and S.
condary 504 centre tapped No. 28
and S.

be precise and correct, the IR
in the windings should be calcu-
nd made equal to core losses, but
s not considered necessary, as the
iameter is small, and the number
s relatively low, with subsequent
sses.

ther problem lies in the fact that
sses for 02 material are not quot-
he operating frequency of the unit.

wire gauges chosen were consid-
presentative of conventional trans-
practice. The only reason for
24 for the feedback winding is a
ical one, as a finer wire is difficult
dle. It is also desirable that the
r of turns per layer fits in with
ailable winding length per layer
venience of construction.

andril of .545in diameter was
on a lathe, with a ¼in shank at
d to fit a standard egg-beater drill
a crude coil winder. A length
was used for winding, as the
m width of the coil insulation is
nd ½in wide tape was used to
leads at either end during wind-

s of .010in Kraft (brown wrapping
were cut to 1⅜in width and used
re and as interleaves.

The transformer was wound as follows:

1. Wind on 2 turns of Kraft and anchor with tape to form a core.
2. Wind on 4 plus 4 turns of No. 24 B and S, bifilar, and spaced to occupy the full width. Both ends need to be anchored with tape.
3. Overwrap with 2 turns of Kraft.
4. Wind on a layer of No. 18 B and S (12½T, bifilar) interleave with one layer of kraft and add a further layer (12½ T bifilar).
5. Overwrap with 2 layers of Kraft.
6. Wind 6 layers of No. 28 B and S as a single wire winding, interleaving each layer with a layer of Kraft, and bringing out a centre tap at the end of the third layer.
7. Overwrap with two layers of Kraft and anchor the end of the wrap.

All the above assumes that the person carrying out the winding is familiar with the techniques for anchoring leads, paper, etc. It is not intended here to go into a detailed instruction on transformer winding, but purely to assist in the layout.

The whole transformer was assembled using a suitable core clamp and was potted in epoxy resin. This was done for a number of reasons, among these being mechanical considerations, and a damping of the somewhat noisy magnetostriction shriek which is characteristic of ferrite cores and is probably familiar to most as a 15Kc whistle in TV sets.

The whole unit was wired up using typical power supply techniques, with a reasonably substantial heat sink for the transistors. A note on heat sinks will be given later.

The first test after establishing that the unit actually works is a measurement of voltage spikes. It may be well to note that the audible note is an indication of operation, and should the unit fail to oscillate, reversal of polarity of the feedback winding with respect to the bases is necessary.

NOTE: Take great care to ascertain that the negative battery lead is applied to the collectors and the positive to the emitters. (Assuming Germanium p-n-p transistors.) Transistors take most unkindly to reversal of polarity, overvoltage, wrong base polarity, etc., and quit with absolutely no warning.

Returning to the spikes. A C.R.O. with excellent frequency response is required for examination, remembering that the rise time is of extremely short duration. The spikes, if of relatively small amplitude (say, less than 10 per cent of the collector-emitter voltage when the C.R.O. is connected between collector and emitter) may be neglected. Otherwise the application of a low-capacity electrolytic capacitor of the order of a few microfarads between each base and the negative battery connections should reduce the spikes to an allowable value.

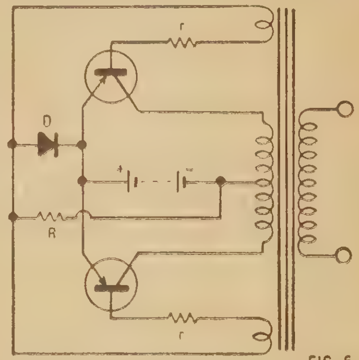

FIG. 6

Without despiking, the peak voltage across the transistor may cause a junction breakdown failure.

Having completed the above check, a load test may be applied and a set of regulation and efficiency curves obtained. A typical pair of curves are drawn in Fig. 7.

Note that the efficiency reaches a maximum just before maximum power output, also that the regulation of the supply is relatively good.

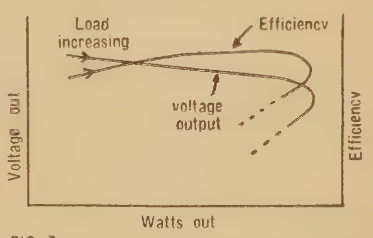

FIG. 7

Note also that the device is self-protecting to short circuit on the load side. Under this condition the oscillation ceases, output drops to zero and a standing current is drawn from the supply.

To obtain starting under all conditions, R was made 330 ohms. Efficiency figures in excess of 80 per cent are obtainable.

The comments already made on construction and testing assume the use of a suitable rectifier and filter, although this part of the equipment is not, in fact, concerned directly with the theory

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A.C. Micro-amps: 0-200.
D.B. -15 to plus 19, plus 33, plus 45, plus 59.
Ohms: 0-100,000.
Kilo-ohms: 0-10,000.
Megohms: 0-1000.
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High Volts A.C. 0-3500, 28,000
DC mA 0-7, 140
DC Microamps 0-50
RE Volts 0-14, RMS 0-40 Volt P.P.
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Ohms 0-5000, 500,000, 50 meg
Microfarads 0-0.03, 0-6
Henries 0-5, 500

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4 Speed Record Player in leatherette covered case with automatic stop, turnover head with crystal cartridge and 2 sapphire needles, plays standard and microgroove recordings. All colours available. Worth 19 gns. Our price is £13/19/6 each.

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3 Speed Record Player Units, consisting of motor and turnover head crystal pick-up 2 sapphire needles. Ideal for both standard and microgroove recordings. Automatic stop. English make. Price only £9/19/6 each.

4-Speed Gramo Motors to operate from 230 volt AC supply. Each has control knob with 16, 33, 45 and 78 R.P.M. positions and on-off switch. Ideal for playing all types of recordings. An excellent job, these are brand new and boxed. Price only £5/10/.

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Crystal Gramo Pick-ups. Excellent quality with turnover head and 2 Sapphire Stylii. Worth £5/15/-. Our price 55/-.

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ed earlier, a few comments may
ful.

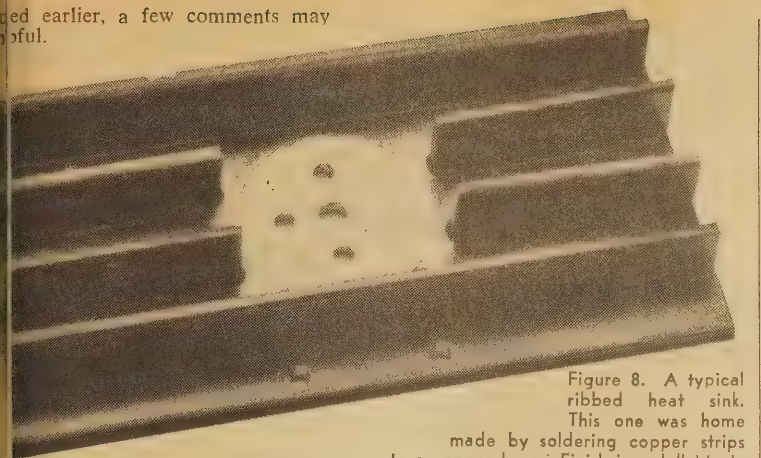


Figure 8. A typical ribbed heat sink. This one was home made by soldering copper strips to a copper base. Finish is a dull black.

customary to use bridge rectifiers
ansistorised converters, if only to
he number of secondary turns. A
of brands of silicon rectifiers are
ng available and they are capable
sing 400 or 500 mA of current
ak increase voltages up to 800 v.
lend themselves ideally to the
circuit. The voltage drop across
al silicon rectifier is less than 1
ving high efficiency and excellent
on.

ising a centre tap on the trans-
half the output voltage is avail-
Remember that total secondary
as designed will now be drawn
wo points.

e supply operates at 2,000 cycles
is simple and a single electro-
pacitor may be adequate for many
s. Also on the output of the
mer is a square wave, the RMS
is also the peak voltage, effec-
educing the voltage applied across
ctifier.

use of voltage multiplier type
s is not considered good practice
transistors look at a different
nce during charge and discharge
of the capacitors in the multiplier.
objections have, however, been
ne in practice. (Biblio. 2.)

SINK

ugh the power actually dissipated
transistors is small, they are often
ipon to operate at elevated am-
mperatures, hence a heat sink is
e. These are usually constructed
ninium or copper, and various
cturers list appropriate curves.
blio. 1.) On some occasions an
um chassis may prove adequate,
chieve greater area a ribbed sink
constructed. (Photo Fig. 8.)

lco Power Transistors: Engineer-
a and Applicator Notes. (General
Holden—Nasco Division, Dande-
ictoria.)

gh Power Transistor DC Con-
T. R. Pye (Texas Instruments
Electronic and Radio Engineer,
1959.

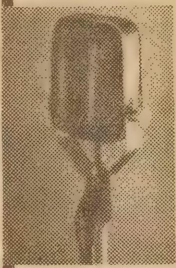
ilips Transistor Data. Latest

ansistorised DC to DC Conver-
W. Johnson. T.C.A. Journal,
No. 1, October, 1957.

Converter Using Push-Pull
ors. Muller and de Sartre (C.G.
), in French. Annales de Radio
te, Vol. 13, No. 53, July 1958.

llard Technical Communications,
No. 17, February, 1956.

er reading may be obtained from bibliographics attached to the articles 2. 4 and 5 above (12 references).



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Monthly News Letter

New equipment released this month should be of considerable interest to the enthusiast. The Wharfdale 12 Coaxial Speaker is now an established fact and after placing a pair of these in the recommended enclosures for Stereo work, the results surprised even us, case hardened as we are. On the strength of their performance we took a pair along with a considerable amount of associate equipment to Bendigo, for a public stereo demonstration, and these two speakers excelled themselves in performance and power handling capacity and we are very happy with the latest addition to the Wharfdale range.

Other equipment used for the Bendigo demonstration were four Wharfdale Super 12s, four Column 8/145 and two large Stereo consoles, one disc and one combined disc and tape machine and the pleasure of the audience made the effort involved well worth while. Arrangements are in hand to repeat this performance in various other Victorian towns.

We have a small quota of the American Golden Classic General Electric Stereo Heads which retail at £24/10/, including a .7 mil. diamond stylus. These represent excellent value and fill a gap that has long been felt for a cartridge of high quality at reasonable price. Tests which we have made have shown excellent response and it looks like the small shipment available will go like wildfire.

Of interest is a sample of the new Quad Stereo Control Head which we have been privileged to see. It is very similar in appearance to the existing Monaural Quad unit, except that the push-buttons are oblong in shape and there is one more. The filter control is still present, but in place of the slope control is the balance Pot; otherwise it remains virtually the same, physical size unaltered. Designed to be used with a pair of Quad power amplifiers, it looks like this will be a very enviable piece of equipment when finally released in quantity.

Quad Monaural control units are now coming to hand and although of course they can be converted to Stereo, it remains to be seen when the price of the Stereo Unit is released, whether this will be a practical proposition. We might mention here that we have in stock other secondhand units in new condition, such as Quad, Leak TL 12 and Varislope, Astronic, Mullard and Pye Amplifiers, which have been traded in on Stereo equipment and can be purchased very reasonably; the Quad, for example, complete and with new guarantee, selling for £75.

An excellent new line is a Transistor Record Player operating from 6 volts internal battery with a very good sound reproduction. The three speed decks for this can also be supplied separately for those wishing to complete their own, or installation into the car parcel tray to play through their car radio.

We are happy to announce that our shipment of German "Graetz" Television Receivers, Radiogram units and Stereophonic Sound systems arriving this month incorporates the most comprehensive selection ever seen here from this world-famous house. The range of over 40 different models will cover both contemporary and traditional styling in cabinet work of incomparable beauty in all timber finishes.

Well, until next month, good listening,

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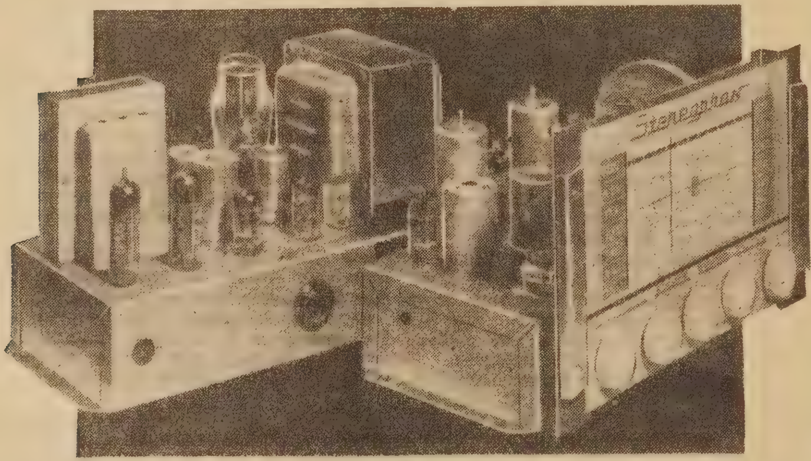

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SPECIFICATIONS O
OPPOSITE PAGE

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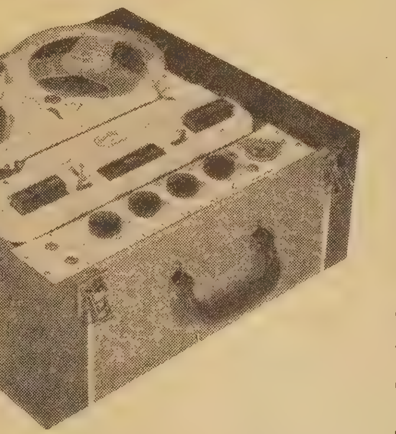

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e seven-valve amplifier, including level indicator, in- porates the latest "Mullard" tape recorder circuit alised to C.C.R. standards giving perfect reproduc- from recorded tapes. Record monitoring and out- to power amplifier. Extension speaker outlet and agic eye" level indicator. Amplifier is completely elded and fitted with perspex dress plate to match k.

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Heads are double coil wound and will reproduce up to 12,000 c.p.s. at 7½ inches per second. Azimuth adjustments on both impedance "record" and "playback" heads. Output of heads is approximately 5 milli-volts at 1 Kc at 7½ inches per second.
- **INSTANTLY REVERSIBLE**
Instantaneous changes can be made from one track to the other. Fast rewind in either direction
- **CONSTANT TAPE TENSION**
A special Collaro device ensures a constant tension on the tape on the take-up spool as it leaves the capstan.
- **FULLY MECHANICAL**
No solenoids are used in the construction of this Transcriptor. The braking is entirely mechanical.
- **FINISH**
Cream Polystrene cover plate with maroon controls.
- **THREE SPEEDS**
3¾, 7½ and 15 inches per second.
- **FOUR HEADS**
Two "Record/Play-back" and two "Erase" heads are fitted on two different levels and head wear thus halves for any given length of track.
- **TWIN TRACK OPERATION**
One pair of heads for each track. Both top and bottom tracks can be recorded or played back without removing tape.
- **PAUSE CONTROL**
This has the effect of stopping the transit of the tape past the "Record/Play-back" and "Erase" heads and applying the brakes to the spools while leaving all switches and mechanical functions in their selected positions. Typical application is to pause whilst recording to omit speech interposed between musical selections. Control will only work whilst it is held in position.
- **TAPE MEASURING & CALIBRATING DEVICE**
The three digit counter makes the location of any recorded passage the simplest of operations.
- **TRANSCRIPTION TECHNIQUE**
A large diameter flywheel with ground and lapped steelshaft running on a ball at the bottom of long bearing reduces friction and virtually eliminates "wow" and flutter at less than 0.15 to 1.0 per cent.
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EW:

dern circuit using nine high gain valves including "magic eye" ndicator, Permatuned iron cored coils and intermediates giving ex- interstate reception and a short-wave range of 12,000 miles. All sed are the new Mullard nine-pin Innoval series.

EW:

ntrol and audio stages incorporating the Mullard 5/10 amplifier vith separate bass and treble controls giving plus or minus 15 db cut at 50 cycles L.F. and 10,000 H.F., combined with push-pull vith inverse feed-back gives you really high fidelity reproduction ır radio or favourite recordings.

EW:

eaker combinations using the new Jensen M.S.P. 12PR woofer atched tweeter and cross-over network giving a frequency of 40 to 12,000 cycles. If required the Rola 12MX speakers can be (with the 8 valve stereo chassis, two Rola 8MX speakers are . A.W.A. output transformers used on all units.

NEW:

Six position selector switch is incorporated in all chassis with compensation for L.P. recordings and provision for stereo, F.M., or TV tuners and tape recorder.

NEW:

Large calibrated edge-lit dial in perspex (11in x 6in) with main stations of each State in prominent type. Dial fitted with counterweight drive, giving smooth tuning. Dial can be supplied in cream, black or brown, with matching knobs and escutcheon to suit contemporary blond or walnut finished cabinets.

NEW:

Sensitive "magic eye" tuning indicator (EM80) making tuning simple and positive even on interstate, overseas and country stations.

All chassis are wired for the fitting of F.M. tuner or tape recorder, special plug being provided on back of chassis, also pick-up terminals and outlet for gramo. motor.

Power switch is fitted to volume control. Audio end of set can be used with TV receiver if required.

Classic Radio

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SEMI-CONDUCTORS OPEN UP NEW WORLD

Data issued by Australian valve companies in the last couple of years indicates the wide range of germanium and silicon devices which are now obtainable in this country. These new components permit smaller, more efficient electronic devices for equipment which could not even have been considered previously.

FIFTEEN years ago, who would have thought of making a hearing aid inside spectacle frames? With miniature transistors, batteries and other components now available this is an everyday job. In fact, as far as we know, there are no current hearing aids made with valves.

Hearing aids are mentioned particularly because they were able to operate efficiently on the first transistors, which had limited power output and limited frequency handling capabilities.

Improved techniques have increased the power handling capabilities of transistors to the point where they can handle power of the same order as normally used in the output stages of radio receivers, a big advance on the few milliwatts of early designs.

Frequencies accommodated efficiently by the early junction transistors were usually less than 0.5 Mc so that they were of little use in other audio applications. At the present time transistors which can cover broadcast band frequencies are readily available at low cost while transistors which can be used as radio frequency amplifiers up to about 30 Mc can be purchased at a price within the range of all.

So far, designers have not solved the problem of making transistors which can combine high power with high frequency. Therefore the power radio frequency stages of transmitters remain the exclusive domain of valves, and are likely to do so for some time to come.

Germanium has been the basic material from which most transistors and diodes have been made. The reason for this choice is that germanium is relatively easy to bring to a high degree of purity by mass production methods and the techniques for making the transistors themselves are not too hard to master.

MAXIMUM TEMPERATURE

However, due to its fundamental atomic structure, there is a temperature above which germanium devices cannot operate efficiently. This temperature is high enough to permit germanium diodes and transistors to be used in most devices but there are occasions when it would be very much more convenient to be able to operate at higher temperatures.

Silicon is the material used for these temperatures. Both diodes and transistors which will operate above the normal boiling point of water can be made from silicon, but they are more expensive the equivalent in germanium. Th because the techniques in dealing the material are so much more di and exacting.

Currently you can expect to buy powered audio transistors only in con types.

Even the long established vibrato genemotor have not escaped the conductor age. First of all the nee high tension supplies derived from voltage primary sources has dimir because such a large part of the e ment can be transistorised and o directly from the battery.

Where valves are needed to deal high power RF, it is possible to use sistors as switches taking the place vibrator contacts. An advantage is the operation of the switches ca controlled electrically with much power than is used to drive a vib Because there are no moving part switching action can be made to place much more rapidly than wit chanical switch. The transforme associated filtering components to h a given power can then be made more compact. Overall efficiency transistorised device is greater worthwhile degree.

This issue contains a practical on a transistor DC power supply you can expect to see a good deal on the subject in the future. In the application of semi-conductors whole is just beginning.

The fact that they are now b ing available in reasonable quantit good news.

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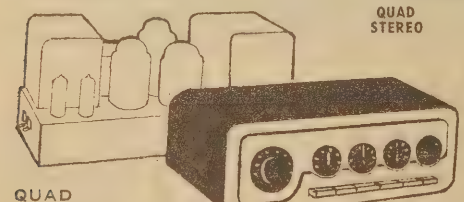
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Here's your answer, Tom!

In his eagerness to learn, Tom has another series of interesting questions for this month. The queries are quite varied in nature, covering a number of subjects. No doubt you will find an answer among them to several that have been bothering you. Take the first one for instance.

Has a directional aerial any advant- e over a stationary one?

/e will not attempt to answer your stion in its exact form, Tom, because don't think that it expresses what have in mind.

riefly, the story is this: When one .ts to listen to signals on many differ- frequencies and coming from many rent directions, the only practical rse is to put up an aerial which is onably omni-directional. Most of receiving aerials which people string and connect to their sets fall into class by accident, if not by design. one is interested in listening to sig- over a narrow band of frequencies, of transmitting within the same band, roved signal strength can be achieved erecting a resonant aerial system.

lost resonant aerials are inherently ctional and it is usual to locate them uch a way that they favour the direc- in which communication is to be blished. Thus many amateur and mercial radio stations use a fixed ctional aerial system.

some cases, they have a number of aerials, which can be selected at

'here communication is to be estab- d on a particular band of frequen- but from many different directions, ssible solution is to make the aerial m directional, as before, but physi- rotatable. The whole system tends ecome rather complex mechanically, rell as costly, but it can be justified ecial cases.

ierefore, Tom, it isn't so much a er of which is best. It's more a mat- of what you want and what you can d. However, since directional aerials usually resonant aerials, there's no t in worrying your head about direc- l or much less rotatable aerials for ral listening.

* * *

have frequently noted the term used when referring to an aerial. v is gain achieved with an aerial?

directional aerial system may be to concentrate the radiated energy ie direction or directions where it be most useful, and in that way to ase the apparent power of the trans- r. The extent to which it does this pressed as the gain of the aerial at direction.

is the number of times the intensity idiated power is greater in that ion than it would be if the total r were radiated in all directions.

r example, if the radiated power concentrated uniformly into a beam fth of the whole surrounding e, the gain would be 5.

thin that beam, the radiation would be the same as if five times the power were being radiated uniformly in all directions.

With receiving aerials, gain denotes the ratio of the efficiency of a given aerial to that of an assumed standard, usually a single half-wave dipole. In other words, gain is the ratio of the signals delivered to a receiver by the two aerials, other factors being kept constant.

What is true of transmitted signals is also true of reception. As the field pattern of any aerial is reduced or rather concentrated toward a particular direction, the apparent strength of a signal coming from that direction is multiplied.

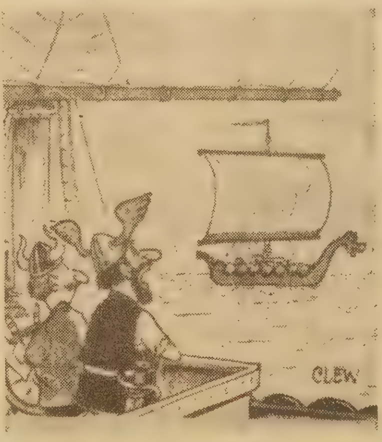
Thus an enormous effective "gain" can be achieved in point-to-point communication systems by using highly directional aerials for both transmitting and receiving.

* * *

I have seen mention of ion traps on TV picture tubes. What is their purpose?

The glowing cathode of a picture tube, Tom, expels not only electrons but other particles, too, mainly fragments of molecules. Some of these particles are electrically charged and are called ions. These ions will follow the same general path as the electrons and bombard the luminous screen.

A simple fluorescent screen is not capable of withstanding bombardment from these ions, which may be several thousand times heavier than electrons. They would produce rapid deterioration and loss of picture brightness, particularly near the centre of the screen. This is referred to as "ion burn."



"By Odin—I thought OUR sails were white . . ."

— TV Times.

To overcome this problem, use is made of the fact that, because of the greater inertia of the ions, they are deflected by magnetic fields to a far less extent than the lighter electrons.

If the electron gun is built obliquely into the tube and a short magnetic field is placed just in front of it, then by careful adjustment of the field the electron beam can be deflected exactly along the central axis of the tube, while the heavy ions carry on in a near-straight line and are caught in a diaphragm located in the anode structure.

This arrangement is called the ion trap. The little magnet which is responsible for redirecting the electron beam is mounted on the neck of the tube in a simple clip, so that it may be turned around and moved along the neck of the tube.

Careful adjustment of this magnet is necessary for, if it were not positioned exactly, the electron beam would fail to be deflected through the hole in the centre of the ion-catching diaphragm. The electrons could thus be partly or wholly trapped in the same way as the ions.

Quite apart from the fact that the luminous efficiency of the screen would be reduced, the bombarded point of the diaphragm would become incandescent and turn into a new and dangerous source of ions.

In the most modern tubes, the luminescent screen material is backed by a microscopic film of aluminium, which acts as a mirror and greatly increases the light efficiency of the screen material. However, it also protects it against ion bombardment and, along with other precautions in the design of the tube, allows the ion trap system to be eliminated.

Thus, most modern tubes are of the straight-necked variety, with no ion trap.

* * *

Is it true that many picture tubes are metal backed or mirrored and, if so, why?

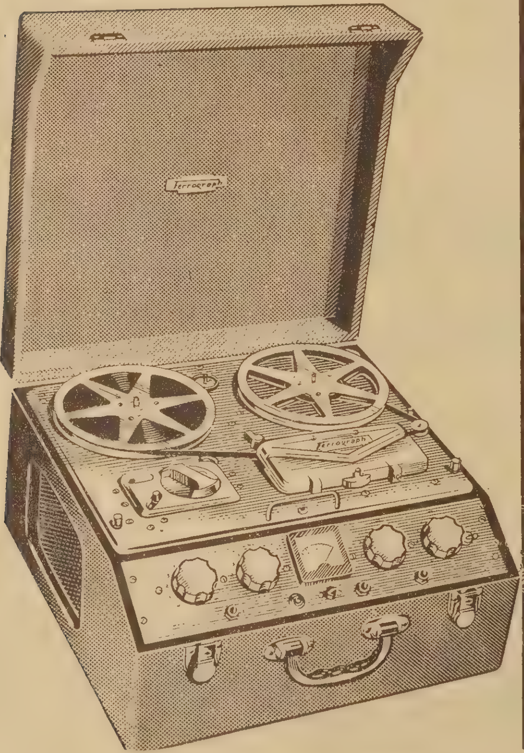
We've already answered this question in part, Tom.

Yes, it is true that most modern picture tubes have a screen which is mirrored on the inside. By a very tricky manufacturing process, the luminescent coating of these tubes is provided with an extremely thin mirror-bright coating of aluminium.

The layer of aluminium must only be a few molecules deep, to allow the electrons to penetrate it and to reach the actual screen, but its depth is sufficient for it to act as a reflector of light.

Without it the screen emits as much light to the interior of the tube as at the viewer. The metal backing reflects much of the light emitted inwards and strengthens the light output from the

8 IMPORTANT DESIGN IMPROVEMENTS IN NEW FERROGRAPH SERIES 4



This latest development of the incomparable Ferrograph incorporates several new design improvements and will enable every Series 4 Ferrograph to be readily adapted at any future time for a variety of applications. For example, space has been provided under the Head Cover to permit Head changes and additions for monitoring, stereo recording, stereo playback, dual track stereo to the new American standard or for lower track use. Such heads are designed to be plugged in and are fitted with rocking facilities for azimuth correction.

Also, this new development permits any Series 4A to be instantly converted to a Series 4S merely by plugging in the additional stereo head.

Other important design improvements are:

- The capstan motor is resiliently mounted for quiet operation.
- Function Switch Knob is re-fashioned for greater ease of operation.
- Brief Stop is now a standard fitting on all Ferrographs.
- The Head Cover—a one-piece moulding—is hinged for easy tape loading.
- The Turns Counter—now gear driven—is accurate to a turn.
- New standard colour scheme for all models—2-tone grey.

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With standard monaural recording/playback facilities.
Model 4A/N 3¾/7½ i.p.s.
Price £239 2 6
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With full stereophonic recording and playback facilities.
Model 88 7½/15 i.p.s.
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With optional stereo sound playback facilities in addition (when used with Stere-Ad Unit).
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Stere - Ad Unit (when required) £90 9 0

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THE INCOMPARABLE *Ferrograph*

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PLEASE WRITE TO US FOR FULL DESCRIPTIVE LITERATURE AND NAME OF YOUR NEAREST DISTRIBUTOR AND SERVICE AGEN reen. The picture thus gains in brilance.

Less light inside the tube, reflecting ack haphazardly on the screen, means iat "black" areas on the picture are not ghtened by internal reflections. Thus ntrast is improved as well.

Then, as we have already pointed out, e aluminium layer protects the lumines nt screen material from damage by ns.

* * *

What is meant by cross-modulaion?

In its most common form, crossodulation occurs in the RF stage of receiver and results in two or more nals being heard together. It is often istaken for lack of selectivity, but is quite different effect.

In most cases, only one tuned circuit ecedes the RF amplifier stage and it possible for several signals to be prent on its grid. Normally these signals e progressively attenuated by follow tuned circuits in the receiver, so that ly the wanted signal is heard from loudspeaker.

However, if one particular signal is ry strong and/or the RF amplifier is n-linear in its amplification, partial tection takes place in the stage and e or more of the additional signals modulated on to the wanted one.

Thereafter, no amount of selectivity ll get rid of the interference because has, in fact, become part of the want signal.

The strange part about it is that the erference disappears when the set is ied away from the wanted signal. This quite different from a simple lack of ectivity, where strong signals tend to ead over substantial sections of the l and are heard, irrespective of ether the receiver is tuned to someng else.

* * *

How does an electrostatic voltmeter nction?

The electrostatic voltmeter, Tom, ctions due to the law of attraction ween two bodies at different poten. The force of attraction is seldom ugh to be noticeable, but if the poten difference is not too small, it can measured by a delicate instrument.

n the electrostatic voltmeter a rotat set of small metal vanes is held rt from an interleaving fixed set by airspring. When a voltage is ap d between the two sets the resulting action turns the moving set of vanes ugh an angle, depending on the volt and the strength of the opposing ng.

his type of instrument is a true meter, since it does not need current its operation. However, it is limited very high voltage readings, usually 0 volts and higher.

* * *

What is an electrostatic microne and how does it operate?

n electrostatic microphone is the as a capacitor microphone. The hragm of such a microphone is one of a capacitor, while the second is fixed. The diaphragm is left arth potential and the back plate is d several hundred volts above 1.

und waves impinging on the diagm cause it to vibrate, thus varying capacity between the diaphragm and the back plate at an audio rate. The resultant alternating potentials are applied to the grid of a valve and amplified in the normal manner.

The disadvantages of this type of microphone are very low output and high impedance. This necessitates the use of a high-gain, low noise preamplifier very close to the microphone. While representing an undesirable complication, the end result can be very good indeed from the point of view of audio quality.

* * *

What is a coherer?

You are certainly going back a long way, Tom, for the coherer was a very early form of detector used in the first practical reception of radio waves.

The coherer consisted of a glass tube containing metal filings. This normally had a high resistance, but the passage of radio-frequency currents caused the filings to cohere and become more conducting. It was necessary to reset the device after the passage of R.F. current by shaking up the metal filings again.

The usual method of achieving this was by means of an electromagnet operating as a tapper on the tube. In some cases the signal itself was made to operate the tapper and, in that case, the device became self-restoring.

* * *

What is known as the E-layer?

The E-layer is a region of ionised gases at a height of from 50-90 miles above the surface of the earth.

The ionisation is mainly due to direct electron bombardment from the sun, but ultraviolet radiation probably accounts for some of it.

This ionisation exercises an appreciable effect on radio waves propagation and the mean height at which this occurs is about 70 miles. The lower limit is not clearly defined and varies from winter to summer and from night to day.

This layer is responsible for the reflection of most medium frequency waves and the lower waves of the high frequency band. It is less intensely ionised than the F-layer immediately above it, but, because of the higher gas pressure, it is more stable and less dependent upon the sun's influence.

* * *

What is known as the F-layer?

The F-layer is the region immediately above the E-layer and ranges to about 250 miles above the earth's surface.

This region probably consists of helium; its pressure is very low and the ionisation very intense. The ionising agent is the ultraviolet radiation from the sun. Because of the low gas pressure it is more dependent on the ionising influence than the E-layer. Recombination of the ions usually takes several hours after the sun has set while re-ionisation occurs very rapidly after sunrise.

Since the formation of the F-layer depends on the sun, its height and density vary by day and night, seasonally and with sunspot activity.

In the day the layer splits into two layers known as the F1 and F2 layers and during the night the F1, which is the lower layer, disappears, leaving the F2 layer.

The F-layer is responsible for the reflection of most high frequency waves, the critical frequency being higher in the day than at night and lower in winter than in the summer.

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TRADE REVIEWS AND RELEASES

NEW PHILIPS WIDE RANGE OSCILLOSCOPE HAS RESPONSE TO 14Mc

Detailed examination of extremely fast transient phenomena is possible with the Philips GM 5662/01 oscilloscope which was recently made available to us for use in the laboratory. The vertical amplifier has the widest frequency range of any instrument we have yet handled.

Manufacturers ratings state that the vertical amplifier frequency response is flat within 3 db from 3 cps at the low end to 14 Mc at the high frequency end with 30 per cent of the level response still being available at 25 Mc. When it is noted that the instrument is in a single case which can be carried easily by one man and is capable of producing an undistorted peak-to-peak deflection of 2in, the performance is really excellent.

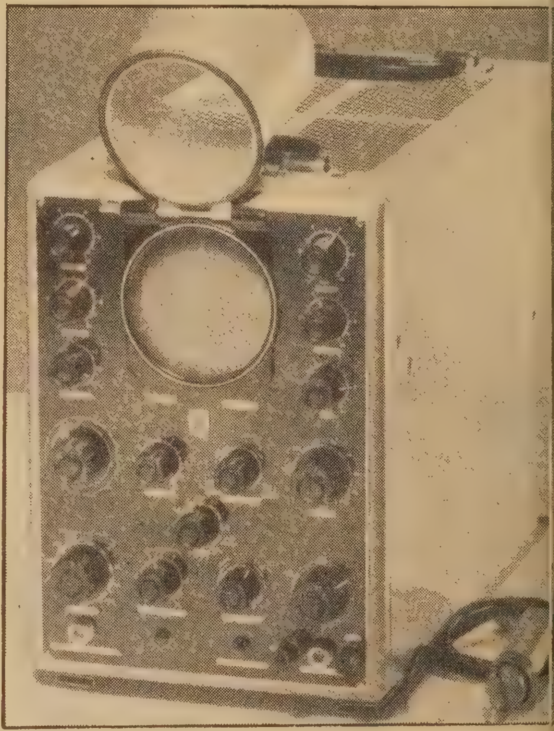
The price of £254, plus tax where applicable, is competitive for an instrument of this class.

The instrument has so many controls and facilities that, frankly, we had not realised its full potentialities in the few weeks that it was available to us. However, we did gain the impression of an extremely valuable and versatile oscilloscope.

Although the wideband vertical amplifier is AC coupled only, the horizontal amplifier is direct coupled and full use can be made of this feature by connecting the time base to the normal vertical amplifier. The need for viewing the image on its side is a disadvantage but is a small price to pay for the advantage of virtually two CROs in one.

Internal calibration for both voltage and time is provided, the former having three ranges and the latter four. The time calibration makes use of an inbuilt circuit which results in the display of a damped oscillation of known frequency on the screen. This permits the time base and expansion controls to be set so that a given marking on the graticule represents a convenient amount of time.

The general finish, trace quality, etc., is up to the high standard of the other Philips oscilloscopes we have reviewed recently. Further information is available from Philips Electrical Industries Pty. Ltd., of 69 Clarence Street, Sydney.



The Philips GM56-62/01 oscilloscope probe and stray light shield. The dimensions are; height 14in, width 10in and depth 21in. The weight is 66lb. Vertical amplifier is within 3db between 3cps and 14 Mc with 30 pc response at 25 Mc. Sensitivity is better than 50 mV p to p per cm. Horizontal amplifier is direct coupled and 3 db down at 800 Kc. Sensitivity is 600 mV p per cm.

SCOPE WIRE EJECTOR SAVES TIME

People making extensive use of screened cables will appreciate the Scope wire ejector which makes a quick, neat job of what can otherwise be a time-consuming bottleneck.

The purpose of the tool is to push the inner core of screened leads or coaxial cable sideways through the screening.

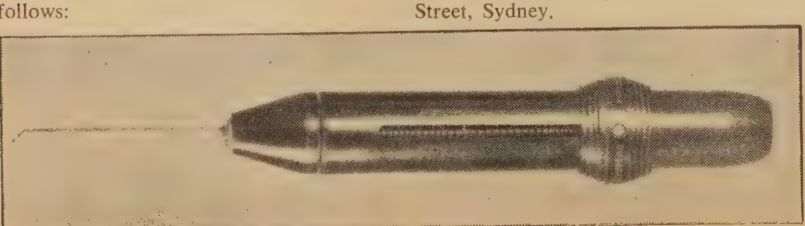
At present the wire ejector is available with nozzles No. 12 (0.012in inside diameter) and No. 14 (0.014in inside diameter). Other sizes will be available in the near future.

The procedure for using the tool is as follows:

1. Remove any outer insulation over the metal braiding.
2. Insert nozzle of tool between the metal screening and the insulated core of the cable to the required depth.
3. Use the pointed end of the nozzle to penetrate between the strands of the braiding.
4. Hold the braiding over the nozzle between two fingers and push the ring on the handle forward. This will eject the cable through a side hole in the braiding.

Our own experience was that the device works best on cables with a fairly open braid.

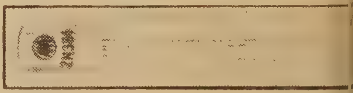
The retail price is 35/ and further information is available from Wm. J. McLellan and Co. Pty. Ltd., 126 Sussex Street, Sydney.



250Mc TRANSISTOR

THE 2N384 is a "drift" transisto the germanium p-n-p type. It is signed for use in oscillator circuits to 250 Mc or in RF amplifier circ in compact equipment.

The 2N384 has a frequency for u power amplification of 250 Mc, an al cutoff frequency of 100 Mc, a low lector transition capacitance of 1.3 and a base resistance of 50 ohms. unilateralised common-base circuit, transistor can provide a power gai



15 db at 50 Mc. These features, in tion to a transistor dissipation ratin 120 mW at 25 degrees C and 35 m 71 degrees C, permit the design of circuits having high input-circuit e ency, excellent operating stability, automatic-gain-control capabilities ov wide range of input-signal levels, good signal-to-noise ratio.

Another important design feature tributing to the usefulness of the 2N in VHF applications is the use of sh ing to minimise interlead capacitanc

The retail price is £6/0/4. Sup are available immediately. For fu information, contact A.W.V., 47 Street, Sydney.

HILIPS TRANSISTORS

A worthwhile contribution to
:urrent literature on semicon-
luctors is "Germanium and
ilicon Transistors and Diodes,"
roduced and published in Aust-
alia by the "Miniwatt" Electron-
:s division of Philips Electrical
ndustries Pty. Ltd.

E current 5th edition is produced in
the same 8½in by 11in format as the
ips volume on valves for Australian
ision receivers produced in 1955.
ne three main sections of the book
with (1) the application of semi-
luctors, (2) diodes and (3) transistors
oductory chapters treat semi-con
or materials generally, the operation
ansistors, transistor amplifier design
lead to the description of two prac-
amplifiers, the larger delivering 10
. One of the several other pro
for which values and other prac
data is given is a 7 transistor super
receiver.
igineering data on individual diodes
transistors is very comprehensive
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that there is a tendency for the
ny's products to standardise on
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oint of view of readers, the re-
e of speaker connecting leads is
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coil filter networks are easier to
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second publication, "Vented En-
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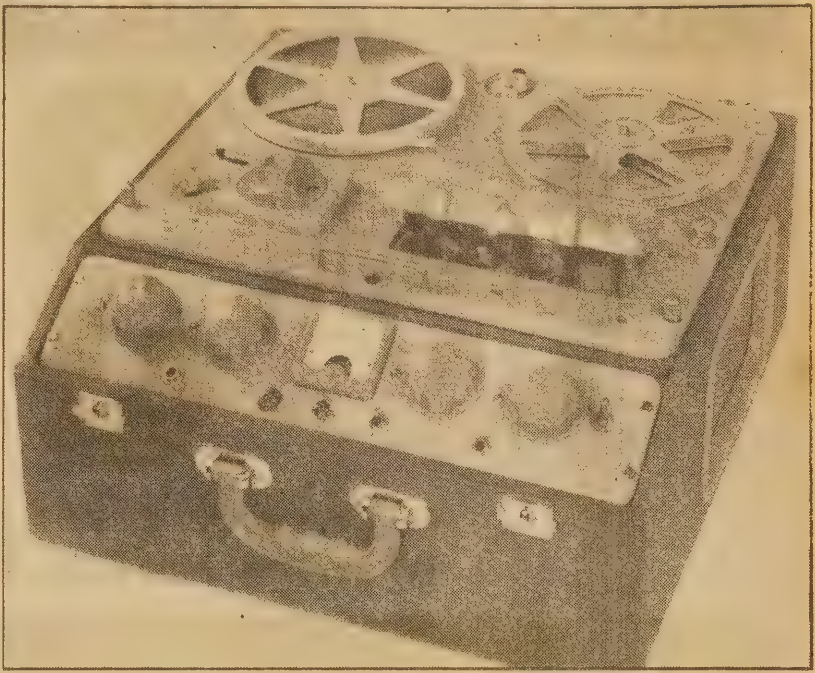
ADVANCED FERROGRAPH RECORDER



The Ferrograph tape recorder which was tested in Radio, Television and Hobbies laboratory.

An attractive new model of the popular Ferrograph tape recorder is now available in Australia through Messrs. Tape Recorders Pty. Ltd., of 183 Pitt St., Sydney . It is designated as the Series 4 recorder.

IN size and general layout, the new model is similar to the earlier series 3 but several improvements have been effected and the unit has been made readily adaptable for playing stereo tapes.

A new styling has been adopted for the front panel, the essential operating controls being grouped on a raised panel, matching that which houses the tape heads and capstan mechanism.

This latter is now made in one piece and hinged so that it is lifted up to load the tape, then dropped down over it to enclose the mechanism completely. A push-button on the front allows the tape to be stopped instantly for editing purposes.

ACCURATE COUNTER

Another new feature is the gear driven tape footage counter. This is now highly accurate and on test it was possible to select a particular spot on a reel of tape after it had been shuttled through the recorder in both directions at high speed.

The tape handling qualities of the machine are excellent, as before. Models are available for either 3¾ and 7½ inches or 7½ and 15 inches per second. Both have fast forward and rewind facilities and a single stop button brings the tape to a halt without sign of strain or overrun.

Our only criticism is that this button is rather too small for the job it has to do and. if the finger is not accurately placed on it, it can bear against the panel before the button is properly actuated.

The series 4A recorder comes with normal monophonic record and playback facilities. However, plug-in heads are used so that it can be converted for lower track use by plugging in a suitable head or, similarly, to play back twin-track stereo tapes. An additional amplifier attachment, plugged into the rear of the unit, handles the output from the second track.

Retail prices for the Model 4A are £239/2/6 for 3¾/7½ i.p.s. and £271/12/6 for 7½/15 i.p.s Model 4S. supplied with stereo head retails for £268/0/9 and £289/1/, according to speeds, while the separate add-on amplifier unit is available for £90/0/9.

Model 88, containing built-in stereo record and playback facilities retails for £302/7/6.

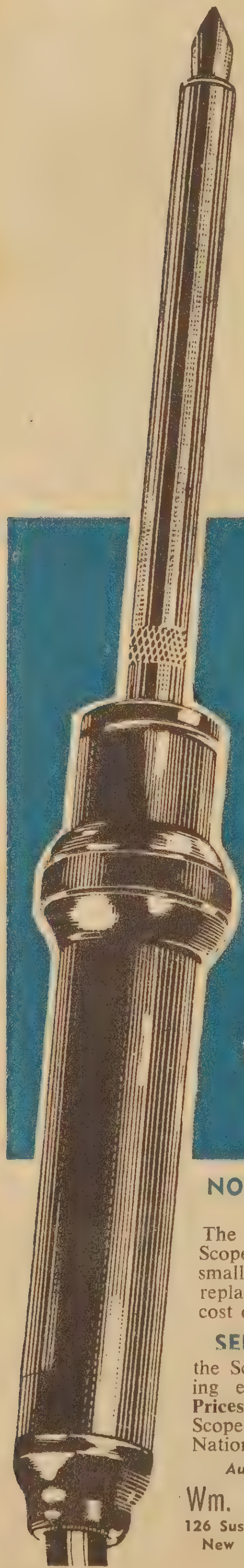
The unit supplied to us for test was the 4A/H (7½/15). Performance was excellent in all respects and reproduction from a pre-recorded commercial tape, was of a very high standard.

VOLTAGE VARIABLE CAPACITORS

JACOBY, MITCHELL AND CO., P/L of 469 Kent Street, Sydney, advise that they are the sole Australian agents for Pacific Semiconductors, Inc., of California, manufacturers of "Varicap" voltage variable capacitors. These capacitors were mentioned on page 21 of the April issue.

Varicaps have advantages over mechanical tuning capacitors and reactance tubes, in many applications, and there is no doubt that many new uses will be found for them. Their size is comparable with that of an ordinary miniature germanium diode.

No wrist fatigue *with* SCOP



weighs 3½ OZS.

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HOT in 6 seconds!

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The Scope iron is fed from a low voltage transformer or 4-6V accumulator via a special multi-strand 2-wire cable that gives maximum flexibility.

NO DANGEROUS VOLTAGE

The Scope Iron gives maximum safety in that it operates from extremely low voltage. The National Scope Transformer available with the iron has an output voltage of 3.3V and is especially designed for maximum protection on the mains input side. The National Scope Transformer is fully approved under Prescribed Articles of the Electricity Authority Approval No. N/156.

NO WASTED TIME IN HEATING

The Scope Iron heats instantly, attaining full operating temperature in 6 seconds.

NO EXPENSIVE REPLACEMENTS

The only "consumable" parts in the Scope iron are the copper tip and small element, both of which can be replaced easily by the owner at a cost of a few pence.

SEE . . . TRY . . . COMPARE

the Scope Soldering Iron at all leading electrical and hardware stores.

Prices:

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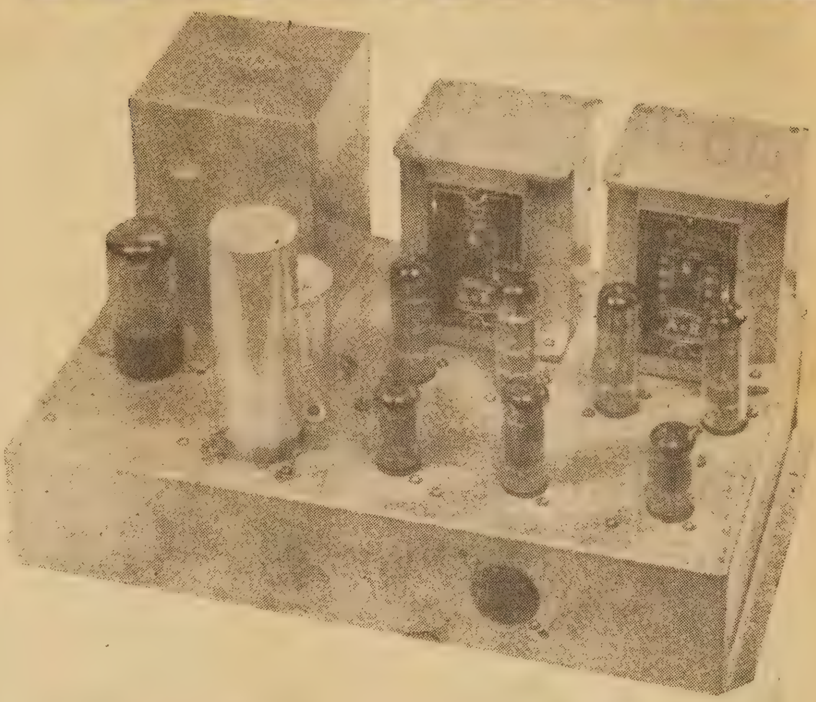
lectronic Parts Pty. Ltd., 206 roadway Sydney have been pecialists for a long time in its for receivers and amplifiers escribed in our magazine. hey have made a particular ffort to exploit the Playmaster ries, most of which can also be btained ready built if required.

10 WATT STEREO AMPLIFIER KIT



A 10-watt stereo amplifier built from a kit supplied by Electronic Parts of Broadway.

CENTLY we received a sample kit for the 10-watt stereo amplifier, h has now become a standard de- in this field, and, as a matter of we built it and put it through its s.

ie kit came complete to the last de- It was neatly packaged either oxes or small bags into which the ponents had been grouped.

erything was included, such as -than-ample resin-cored solder, -up wire, spaghetti, brass nuts and , washers, etc.

COMPONENTS

iere for reasons of temporary sup- difficulties components other than originally used were included, the ire annotated to this effect to avoid ision to the builder, but in our case duplicates were available through- Electrolytic capacitors are the main em in this regard.

ready-cut and hammertone-finished is served as the container for the onents, and the appropriate pages a copy of the magazine were in- d as instruction sheets.

parts were of first quality, and was no evidence that any short had been taken to reduce the price.

e amplifier was built up in about three evenings, and when finished looked exactly like the original.

On test its performance was of the same order. Sensitivity, power output and feedback tallied exactly and there was no need to modify the amplifier in any particular before use.

Connected into a stereo system in place of the original, there was no apparent difference in the results.

If this kit is an example of Electronic Industries approach, their customers need have no fears that they will not all be true to label.

OCK-DOWN EAKER BAFFLE

REO has brought with it the need or two-speaker systems, and much ht on the part of those concerned velop an inexpensive but good d of providing them.

: Rola 8MX has proved a popu- speaker for moderately priced . The Rola Company has designed ted enclosure, which is both effec- performance and modest in size.

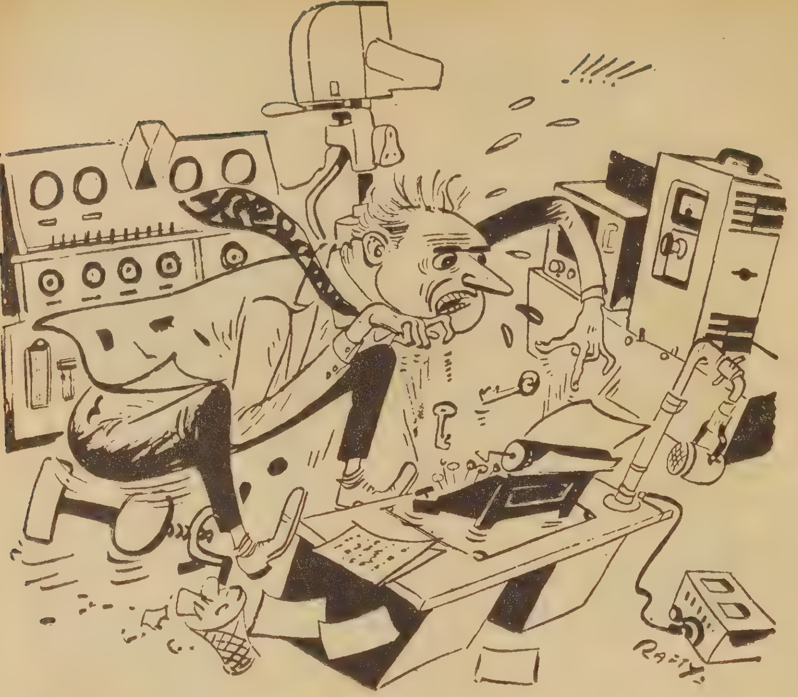
assist the home builder, Stereo- : Sales have produced a ready-cut ntaining all the panels, beading, ig, speaker cloth, legs and even ie and the screws, to make up this ure.

the significant holes are ready and tely drilled and, on a mock as- /, we found the panels fitted to- exactly as planned.

liagram accompanies each kit so ie constructor should have no dif- in completing the job with the st of household tools.

kit comes complete with an 8MX r for a cost of £15/7/6.

Ready cut panels and all components as packaged for 8MX Rola loud speaker enclosure.



Let's Buy An Argument

It might seem that in these columns we should be able to buy all the arguments necessary fo one magazine. But no! Not content with a prosaic recital of how he fixed a dud receiver, ou "Serviceman" now has to get himself involved in verbal fisticuffs on the subject of electri shock.

I NATURALLY read his copy when it came through for the June issue but, apart from making a mental note that it would cause minor comment and amusement, dismissed the matter forthwith from mind.

But the matter was not to end there. A few days ago, our anonymous serviceman friend appeared in the doorway, brandishing a couple of letters and asserting that this electric shock business was now a matter for the "Argument" columns.

So here we are.

LETTER FROM MALAYA

In case you didn't see the June issue, the "Serviceman" quoted a letter in his article from a student in Malaya, explaining how he had "experimented" to see what kind of a shock would be received from 240 volts AC, as distinct from DC.

Having ascertained, the hard way, that it was a very unpleasant experience, he wanted to know why AC tended to "throw" the victim, whereas DC tended to "hold" him.

This is just the reverse to what I personally had considered to be the popular concept, without necessarily assuming that any such concept was really justified. I rather tended to the "Serviceman's" philosophy that all shocks are to be avoided and that the only safe power line is a dead one.

One of the letters to the Serviceman was from a reader in Indooroopilly, Queensland. I quote:

Dear Sir,

Your first column and a half in the June RT&H on electric shock prompts me to suggest that you examine the very comprehensive article on this subject in the December 1954 issue of the Proceedings of the Institute of Electrical Engineers.

Although it occupies 20 pages, it is a most valuable, informative and readable treatise. Half a dozen fellow Engineers to whom I have shown the work have joined me in agreeing on its m

Your faithfully, B

by Neville Williams

Well, I duly looked out the said ar and, while very informative on n aspects of electric shock and rele safety precautions, it made only minor and obscure reference to the lative safety of AC and DC. Perha would be better to say "relative haza of the two.

I shall refer to it again later.

The second letter was a more len one and written by a reader who apparently had long experience in field of electrical reticulation. It is out in full on the opposite page ar suggest that you read it at this junc

EFFECT OF A.C. AND D.C.

It puts forward what I have alre suggested is the popular concept that tends to "throw" and AC to "hold" victim and gives a basis for this belie sounds logical enough.

None of the radio and electrical books immediately to hand had muc say on the subject but I did talk it with a couple of medical practitio whom I know fairly well. Each rem bered doing practical experiments the effect of electrical impulses muscle fibres but neither was very on the finer details.

Each suggested that it would be ne sary to go back over their notes textbooks and re-examine the prc specifically in relation to electric s AC and DC, and to modern treat for same.

In assessing the hazards of an el shock, the first and vital conside seems to be the circumstances which it is sustained.

Most of the shocks which radic electrical technicians receive — an to talk about — are from "minor" tact with high voltage sources "minor" contact, I mean the c brushing of a finger against a live or terminal or touching same wh screwdriver.

IMMEDIATE EFFECTS

The immediate effects are usua quick involuntary withdrawal c hand, an agonised yell and a sm burnt bacon. It might be hard whether the involuntary removal hand is attributable to the actual c flow or to the same kind of mu reflexes which cause one very smal pull one's hand away from a hot

Whatever the cause, the durat the contact is usually very brief in any case, the amount of current a wing through the body is limited by small area of contact on at least one e of the circuit.

The really dangerous situations are se where the victim has a firm grip the live object or is in the act of ing such a grip. The classic hazards faulty portable appliances or supsedly dead wires or pipes, which somee has planned to manhandle.

The area of contact involved is large, initial current is high and there is very strong chance that involuntary iscular action will increase both. rein lies the possible difference beeen AC and DC.

As our correspondent says, AC tends cause sustained muscular contraction, h that the victim may not be able, any natural act of will, to let go of electrically live object. He grasps tightly and possibly begins to perspire, th effects serving to increase the flow current through his body.

Thus, even though the severity of the ck may not be such as to cause "innt death," the effect tends to be cumulative, with the same result not long delayed.

With DC, on the other hand, the tial contraction of the muscles is not tained to the same extent, being folved by some kind of relaxation. And re follows a further vital point of difence between opinions expressed to

Our correspondent, A.G.M., suggests t DC has "no effect" on the muscle er the initial flow of current, so that re is no holding action on the victim. the contrary, he maintains that the iscle may tend to react in such a way to throw the victim away from the e object or vice versa.

CTOR'S DOUBT

One of the doctors I spoke to very ich doubted this. Relying on memory past work, he drew a little diagram ich indicated that there was indeed initial spasm after which the conction decayed away but he wasn't pared to commit himself on how fast d to what extent for what muscles.

The third opinion, also from a doc, acknowledged the initial spasm but ened the "let-go" effect to fatigue but ficiently delayed in time for the curt already to have done its worst in ecting the heart, the respiratory iscles or the brain centres controlling piration.

Thus the victim would let go, but ly as a corpse.

My role here is not to try to offer y ruling but merely to point out conting ideas and concepts and thus prote further argument on the subject. oner or later, the basic facts generally m to emerge therefrom.

However, it does seem that DC does e the victim an extra chance. If the iscular contraction tends to decrease er initial contact, there is a chance t the victim will manage to get clear at least some cases, by reaction or by ort, whichever term best applies.

Nor is this idea without foundation. In Engineering Paper referred to earlier, re is a graph showing the number of ple who can overcome muscular alysis, plotted against frequency and various orders of current through body.

t shows that frequencies between about 20 and 200 cps have the maximum paralysing effect, though little would be gained in terms of safety by using other frequencies which could still be regarded as practicable for power reticulation.

Above 1,000 cps and below 10 cps the paralysing effect diminished rapidly, so that at 5 cps the "let-go" current is 50 per cent higher than at 50 cps and rising sharply.

If one could justifiably project the curve towards zero cycles it would indicate that an average victim could let go an object live at DC much more easily than one live at AC, over a range of current values and provided they are not fatal anyway.

A second preference is in the discussion to the paper where this sentence occurs. "It is well known that AC shock is more serious than DC shock, first because the peak voltage is root 2 times the virtual value but also because the victim gets no benefit from polarisation, such as occurs with DC shock."

However, reference to the lesser hazard of DC goes no further than this, even though it would logically have been developed as a line of thought had it been justified. In the search for safety there is only one major theme, namely reduction of the supply voltage and/or the use of centre-tapped supplies to the lowest practical limits.

There is no hint of the theme "use DC and stay alive."

DC THROWS, AC HOLDS VICTIM

Dear Sir,

I am very interested in the AC/DC controversy mentioned in "Serviceman's" article in the current issue of "Radio, Television & Hobbies" and I think that I can shed some light on the subject.

An electric current passing through a muscle can, if of sufficient intensity, cause it to contract. Remember the twitching frog's legs?

In the case of Direct Current, this only occurs at the instant of contact, the undirectional current flow apparently having no further effect on the muscle. It very rarely happens that the muscle is left in contact with the DC source. Usually the result of the contraction is to break the circuit, with the result that the contracted muscle "let's go" in the same manner as a released rubber band.

So DC "throws the victim," unless he is in a position where he cannot move, in which case he will be severely burned if the voltage is much above 100 volts.

In the case of Alternating Current, the rise and fall of the current intensity as the voltage cycle goes from zero to positive peak, back to zero, to negative peak and back to zero again, has the effect of many (100 per second in the case of 50 c/s mains) DC "shocks" in quick succession, and this causes the muscle to remain contracted for as long as the current passes through it.

So AC "holds the victim."

However there are several qualifications to this last statement. Firstly, it is quite possible for AC to "throw the victim." This has happened to me and the story was printed in your column in "Radio & Hobbies" for July 1954.

In this case I made contact with my finger and the current flowed from one hand to the other. The first contraction of the muscles pulled my finger away from the "hot" terminal and opened the circuit. Then the released muscles threw me some eight feet across the room. This is also what happened to the student in Malaya. The initial contraction of his muscles broke the contact and the reaction of the muscles did the rest.

Secondly, AC can only "hold the victim" if the victim HAS HOLD OF IT. As the action of the alternating current is to contract the muscles, the hands cannot let go of anything in their grasp. If the current is passing to or from something in the grasp of the hands—such as a water tap— the electricity will exert a greater force with the muscles than the owner can and so he cannot open his fingers or release his grasp.

If the hand was closed around a broom-stick and completed an alternating current circuit, the result would be to "throw the victim" as set out above, the "throwing" of course being subject to the intensity of the current and the muscles involved.

The electricity only contracts those muscles through which it flows. I have had the experience of Alternating Current entering my body at the right thumb from the metal screw in the wooden handle of an electric soldering iron and leaving it at the right heel.

All the muscles along the path from thumb to heel were contracted. The fingers were pulled in tight (their operating muscles are in the arm), the hand was pulled inwards at right angles to the arm, the forearm was pulled up tight against the upper arm, the arm was pulled in tight against the body, and the leg was folded up to that my chin was down on my knee and my buttocks resting on my heel.

All this, however, did not prevent me from trying to rotate the handle of the iron with my left hand, kicking my right heel with my left foot or from calling to a man who was running to the control box 50 yards away to come back and disconnect the iron cord at an extension socket.

I can also sympathise with that Malayan student, as all the muscles involved were VERY sore for a week afterwards.

In closing I think that I should tell you that the above conclusions are the result of my own personal experience, without any outside influence, and are therefore fallible.

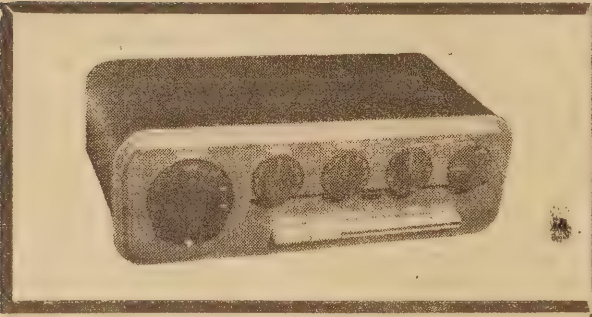
Yours faithfully, A.G.M.

new!

FROM ACOUSTICAL
NOW AVAILABLE IN AUSTRALIA

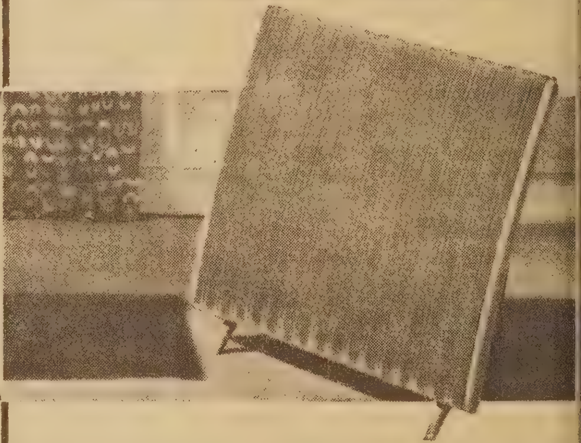
QUAD

QUAD 22 STEREO CONTROL UNIT



The Quad 22 is a development from the world-renowned Quad 11 Control Unit. It incorporates refinements in design, greater flexibility of input, and includes facilities for either stereo or monaural reproduction. Designed to operate from discs, tape, radio and microphone, single channel or stereo, with one or two Quad 11 power amplifiers. Choice of four playback characteristics for gramophone. Bass, treble, balance, filter and volume controls as well as input selection buttons.

QUAD ELECTROSTATIC LOUDSPEAKER



Designed for the highest grade of reproduction under domestic conditions, the Quad electrostatic loudspeaker gives the smooth, natural, non-fatiguing and unobtrusive quality desirable for listening to music of all types. The optimum listening area is that covered by an angle of almost 90° from the front axis. Bandwidth: 45 c/s—18 Kc/s. Rate of attenuation outside band: Asymptotic to 18 dB/8ve. Dispersion: Approx. 70° horizontal, 15° vertical. Dimensions: 34½″ wide, 31″ high. Designed for rooms between 1,000 and 5,000 cubic feet.

BRITISH MERCHANDISING PTY. LTD.

60 Clarence Street, Sydney. BX 1571

British Merchandising Pty. Ltd.,
60 Clarence Street, Sydney.

Please send further information about the equipment illustrated in your advertisement,

particularly ....

To: Name ....

Address ....

To change the subject, I'd like to say nething about colour television.

Now colour television is just what the me says—it's television in genuine our.

The camera analyses the scene in ms of three primary colours and the evant information, converted into ctrical signals, is duly passed through transmitter, radiated into space, pick- up by an appropriate receiver and annelled into a special type of picture e.

Here the electrical signals are re-con- ted into the same three basic colours 1 by a normal scanning process pre- ted to the eye as a composite pic- e.

CTURE SEGMENTS

Individual tiny segments of the pic- e are constituted from different pro- tions of the three primary colours, so t most of the hues and densities ountered in everyday scenes can be roduced or closely simulated.

brown cow, framed against a blue , can munch green grass and dis- rge white milk into a yellow bucket the behest of a rosy-cheeked maid in nauve dress. Its capabilities in this pect are much akin to ordinary colour les and, in fact, I've seen slides copied m a television screen, which a casual wer might mistake for direct photo- phs.

olour television is difficult and costly completely practical. It is in every- use in the United States alongside ck-and-white TV, and is being used demonstration and closed-circuit sys- s in England, Russia and Japan. A all amount of colour TV apparatus currently in Australia and possibly er parts of the world as well.

ustralian standards and transmitters e been selected to facilitate adapta- to colour transmission, if and when s considered to be an economic or essary proposition. As far as I know, one currently has any intention of ng to exploit it.

ut even if colour television is radi- locally, it will appear only as a k and white image on ordinary tele- on receivers—because such receivers circuitry and a picture tube which uite incapable of producing anything .

is not economically feasible to adapt onochrome receiver for colour.

ECIAL RECEIVER

efore anyone can receive a transmis- in colour, they must have a re- er specially designed for the purpose inherently much more complex and ly than one designed purely for black white. The price difference is often igh as two-to-one.

his is the position technically, with- any "ifs" and "buts."

lowever, if one's impressions were e based on some advertisements I've lately, there isn't really any prob- in obtaining colour television. You have it for the outlay of a few eas, by a device which can be ched to almost any television re- er.

hat you get for your few guineas transparent sheet tinted blue at the green at the bottom and with some e nearly neutral colour in the dle. This is placed in front of the picture tube and makes things green where grass should be, blue where sky should be and something else in between.

Of course, it can equally well give your favourite actress blue hair and a green chin!

Now it's not in my province to deny viewers the right to tint their television pictures any way they jolly well like. Nor can I deny other people the right to sell them the piece of coloured whatnot to produce the effect they think they want.

But I do object to advertisements, articles and publicity plugs which resort to terminology which can be misleading to the general public and, further, to statements which are technically untrue.

Colour Television for four guineas? —*Rubbish!*

It passes beyond the realm of viewers' whims to misrepresentation.

First and foremost, the use of tinted filters in front of a black and white screen does NOT give colour television, in the commonly accepted sense of the term.

"But," says the salesman, "there's the colour: Blue at the top, green at the bottom!"

"Therefore, it's colour television."

Mister, you can play games with words any time you like, provided it's with yourself. But when your little game with words and their accepted meaning represents your product as something that it isn't, then it isn't a game any more.

TECHNICOLOR PICTURES?

And a tinted filter doesn't give you "Technicolor" pictures either, as the public understands the term. In fact, I wonder whether use of this name has the blessing of the people who apparently own it?

Some of the advertisements are much more prudent and realistic in their large-print terminology. I can't possibly object to "Tinted" television or words meaning the same thing and free from established usage, as aforementioned. But what follows in small type more than makes up the difference.

I am assured by one leaflet that the filter eliminates "snow" in fringe areas

Rubbish!

"Snow" in fringe areas is purely a matter of signal-to-noise ratio. When the signal is so weak that it can no longer over-ride local interference and the set's own inherent "noise," this latter appears on the screen as a lot of rapidly oscillating dots or dashes.

The only practical methods of minimising "snow" involve increasing the original strength, improving the aerial system or achieving by some electronic alchemy a marked improvement in the receiver's own signal-to-noise ratio.

How can a piece of transparent plastic in front of the screen effect any change in signal-to-noise ratio? How can it even improve it, let alone "eliminate" snow in fringe areas? This is an actual quote.

The only thing it can do is to obscure fine detail, so that you can't see the noise quite as obviously—or the picture detail either.

Three cheaper methods of achieving the same result come immediately to mind:

(1) Defocus the beam in the picture tube.

(2) Move further away from the set.

(3) Use last year's spectacles.

Unfortunately, the line of thought about obscuring fine detail doesn't seem to check with a reference in another advert. This specifically says that use of the filter does NOT reduce clarity.

Apparently it is possible to have one's cake and eat it as well.

But we read on and discover that the filter contributes a three-dimensional effect.

I suppose that anyone is entitled to maintain that he can sense a three-dimensional effect and who can deny it? He's the only one who knows what goes on behind his own private pair of orbs. He may equally claim to gain inspiration from the exotic odour of a pig pen.

Technically, an original flat picture contains no information from which a third dimension can be constituted, despite the number of times systems to achieve this result have been "invented."

Why didn't somebody think before of looking through a plastic sheet?

Then I am assured that the use of a tinted filter will permit the viewer to watch the screen from a distance of one foot. That's very nice and considerate of it but, please, why?

Does it do so by rendering the lines less visible?

Oh no, because elsewhere we are assured that a filter does not reduce clarity.

Does it reduce brightness? Well it might but then so will a slight touch of the Brightness control.

Does it reduce flicker? If it does, it can only do so by reducing brightness, because flicker is a fluctuation of brightness.

WHO WANTS TO?

And, anyway, who on earth wants to watch a television screen from a distance of one foot?

This claim is not only ill-founded, it's plain silly.

Of course, I could go on and talk about "glare" and "eyestrain," those two words which seem to get bandied around endlessly in respect to television. Somebody ought to take these gentlemen aside and explain the basic causes of eyestrain and glare, which they once again "eliminate."

But, of course, they really may not wish to know too much. It might mean removing yet another "claim" from their advertisements. That would be a real shame, because they must have worked ever so hard, in the first place, to think them all up.

That's how it looks anyway.

A NEW MODEL by

Wharfedale: COAXIAL 12

WITH TWEETER VOLUME CONTROL

Based on an entirely new magnet design with two concentric gaps in the same plane, the WHARFEDALE COAXIAL 12 gives outstanding efficiency and performance at a much lower cost than has previously been possible.

The heavy main cone responds smoothly up to 4 kc/s, and has a low fundamental resonance giving superb bass when properly mounted.

Treble output above 4 kc/s is obtained from an entirely separate cone type tweeter assembly with its own magnet gap and aluminium voice coil. The response extends to beyond 20kc/s.

A constant impedance type volume control is connected to the tweeter by 3ft of flexible cable.

Accepted by the Council of Industrial Design for "Design Index."

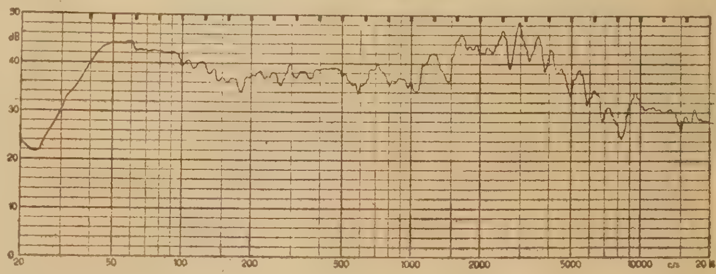
SPECIFICATION

MAIN CONE	TWEETER ASSEMBLY
Magnet gap diameter, 1¾in.	Magnet gap diameter, 1in
Flux density, 14,000 gauss..	Flux density, 13,200 gauss.
Total flux, 155,000 maxwells	Total flux, 44,000 maxwells
Foam surround.	Foam surround
Copper voice coil.	Aluminium voice coil and centre dome.
Fundamental resonance, 25-30 c/s.	

Effective frequency range 25 - 20,000 c/s.
Impedence, 12-15 ohms only.
Weight (including volume control), 18½ lb.

Leaflet giving full data and details of suitable enclosures available free on request.

Axial frequency response of Coaxial 12 unit:



Ask our distributors for a demonstration and full technical data.

MELBOURNE:
Radio Parts Pty. Ltd., 562 Spencer St.
Homecrafts Pty. Ltd., 290 Lonsdale Street.
Warburton Franki (Melbourne) Ltd., 355 Londsdale Street.
J. H. McGrath and Co. Pty. Ltd., 208 Little Lonsdale Street.
William Willis and Co. Pty. Ltd., 428 Bourke Street.

BRISBANE:
Chandlers Pty. Ltd., cnr. Albert and Charlotte Streets.
Trackson Bros. Pty. Ltd., 157-159 Elizabeth Street.
A. E. Harrold Pty. Ltd., 123-125 Charlotte Street.
B. Martin and Co., Wilson House, Charlotte Street.

SYDNEY:
Audio Engineers Pty. Ltd. (N.S.W. Distributors to the trade), 422-424 Kent St.
United Radio Distributors, 175 Phillip St.
Magnetic Sound Industries, 387 George Street.

ADELAIDE:
Gerard and Goodman Ltd, 192 Rundle Street.
Newton McLaren Ltd., 17 Leigh Street.
L. S. Wise Ltd., 196 Gilles Street.
Limbert Radio Co., 16 Charles Street.
Sound and Television Engineers, 233 Rundle Street.

PERTH:
Atkins (W.A.) Ltd., 894 Hay Street.
Leroya Industries Pty. Ltd., 672 Hay St.
Electronic Industries Imports Ltd., 68 Railway Parade.

TASMANIA:
HOBART: Homecrafts (Tas.) Pty. Ltd., 220 Elizabeth Street.
Findlays (Hobart) Pty. Ltd., 80 Elizabeth St
Watson's Wireless, Collins Street.
M. T. C. Gessup Pty. Ltd. (incorporating Crosby Walch), Elizabeth Street
LAUNCESTON: Homecrafts (Tas.) Pty Ltd., 120 Charles Street.
Don Phillips Radio, 87a Brisbane Street
M. T. C. Gessup Pty. Ltd., 98 Charles St

Australian National Distributors: **Simon Gray Pty. Ltd.** 28 Elizabeth St., Melbourne, C.1., tel's: MF 8166, 821

OFF THE RECORD — NEWS & REVIEWS

As each new batch of stereo records appears, the large majority continue to justify the thought that the standard is improving by leaps and bounds. The best of them are beauties and I can't think that we did any better with straight LP's. There are indications that the teething period for stereo is rapidly nearing its end.

by John Moyle

JUSTIFIABLY, perhaps, most concern popular music, in which field some are truly spectacular. But then the popular field has always been well served n this way.

Any fears we might have had about recording quality must have gone by he board a long time ago, and every week brings evidence of more doubt dispelled.

I don't think there is much question that great improvements have been made n cutting technique which have enabled amplitude to be increased, as I mentioned last month, with less distortion.

Some of the discs I have been reviewing recently are particularly good in this respect, and I find the gain control working further and further back towards zero for the same output.

This has done wonders in reducing surface noise of all kinds, including rumble, but it's not all the story.

CLEANER GROOVES

I am sure the grooves are more cleanly cut, and probably the matrixing more efficiently carried out, than in the early days. I confess I was beginning to be disappointed if not dismayed at the inferior surfaces appearing on even reputable discs, whose makers had shown great adeptness in quietening their L.P.s.

It is obvious that surface noise is something we should simply not be asked to endure from now on, and the manufacturers can thank themselves for raisng our standards of listening.

They have shown us, by their issue of many outstandingly quiet discs, that such things can be done, and if they can make so many good ones, there is no reason why it should not be possible to make more like them, if not the lot.

No one can minimise the difficulties of producing discs, particularly stereo discs, to such rigid specifications, but the manufacturers have themselves accepted the challenge by going into the business.

GOOD PROSPECTS

They have succeeded so well that, in their best efforts, I am beginning to find less and less to cavil at. I can, in fact, see a situation arising in which records will vary in many ways, but they will all be good.

The kind of sound we hear from the best stereo today is something I have been dreaming about for 30 years.

From now on we can't willingly accept, and particularly reviewers should not accept, records with surfaces below par, or which have obvious blemishes n cutting or pressing.

One manufacturer at least has been a ittle perturbed of late with what he considers my too severe standards, paricularly in the matter of surface noise.

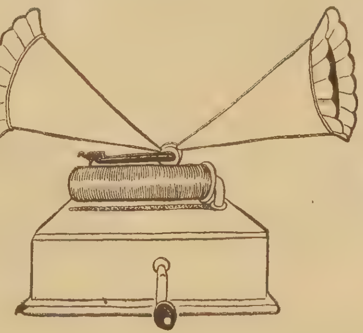
And I freely admit it is something I watch like a hawk, because, although I know it may vary somewhat from pressng to pressing, I think you as readers are just as interested as I am to have discs which play quietly.

I don't think it is fair to say that, because I use high quality equipment, I am more likely to hear surface noise than the average radiogram owner.

The chances are that I might hear less.

With all due respect to them, the average radiograms are by no means free from peaks in the middle and upper middle registers, and there is nothing to show up surface noise more severely than this kind of reproducing curve.

Nor has volume much to do with it, if we exclude the very soft or the unbearably loud.



Maybe I play records a little more loudly than most, but I know enough now to assess the noise from the surface as a ratio to the amplitude of the sound.

And, don't forget, we are now getting discs so quiet that, even at loud room volume, there is virtually dead silence on the quiet grooves.

After all, that's the test that it can be done.

Without a doubt, in the next few months we will be able to collect a library of sound the like of which we have never before heard from discs, and this is only a prelude to the complete restatement of the gramophone repertoire from top to bottom.

I have always been enthusiastic about stereo since the first single track discs were issued, and never so sure of its future as I am now.

The latest major record label to issue stereo discs is Coronet, who so far have delayed their debut no doubt for their own good reasons.

The mainstay of their catalogue comes from the American Columbia, whose pioneer engineering in various stereo methods, and in the L.P. record itself, is enough to guarantee continuance of high quality engineering.

My advance copies of the first six Coronets, some of which are reviewed here, justify this belief.

In fact it gives point to my previous remarks about surface noise, for these are among the best.

And in all instances the sound is so good as to demonstrate beyond doubt that lateness in the field has nothing to do with quality.

During the next few months I will be overseas again, and occupied with other matters, but I am hoping to make enough time to observe what is being done in the recording field, not forgetting that Geneva is the home of the Swiss Romande Orchestra. Unfortunately I may not be able to meet again many of the well-known people in the industry who were so good to me in 1956.

Stereo discs had been seen then in only one experimental example, but their inevitability was the most vivid impression I brought back with me. It will be quite fascinating to observe the changed scene this time, particularly in America.

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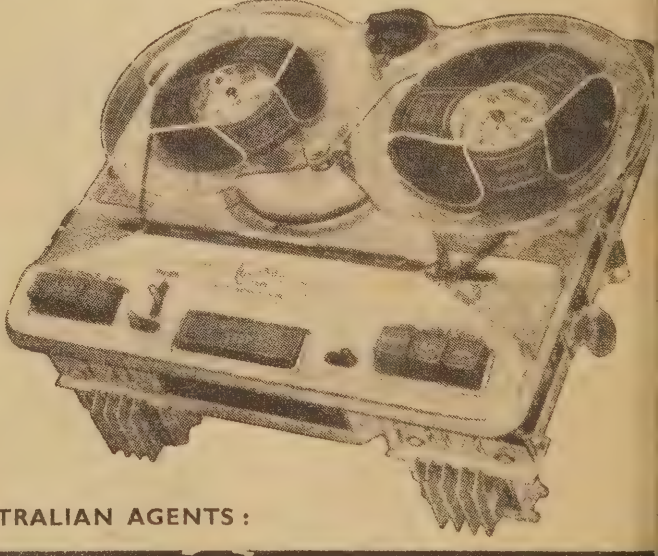

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669

Ɔther manufacturers have already 'en us a sample of how good they · in the classical field, which interests many of our readers.

It is with impatience that I await · first of the "heavy guns" of which lumbia has such a store.

★ ★ ★

MALAGUENA, MUSIC OF CUBA -Fifteen numbers played by Percy aith and his Orchestra. Coronet LLS597 (Stereo).

Percy Faith is one of the most suc- ssful of all the popular symphonic nd leaders who are building them- ves a very important place in the rary of recorded music.

They are demonstrating that one edn't be noisy, inane or vulgar to peal to popular taste, and that there a vast amount of good music which n be adapted to the purpose without ing violence either to it or to any ade of listener.

Admittedly Faith does not often go tside the legitimate scope of his inten- ns; that is to say his Mexican music true to label, just as this collection of iban music is authentic in origin.

His skill lies in his blending of his own e and catholic style with his subject atter, always with success and often th great brilliance.

He has learned from many of his pre- cessors and even his contemporaries, t excluding individualistic masters ch as Mantovani, and yet we have little ficulty in recognising his style as his n.

This disc isn't quite a "Viva," but it 't very far behind, and that is high aise.

It is big band stuff, with pronounced verberation, but he often brings his loists well to the fore in a manner ich could only be achieved in a re- rding, and provides a fascinating blend presence highlighted by the more dis- nt accompaniment.

The sound is rich and varied, with a oving texture that is just as interesting examine as it is fascinating to hear.

The stereo spreads beautifully with a ry good sense of depth. He has wise- refrained from using separation too ely, featuring it as a means to an end ther than a gimmick.

Cutting amplitude is quite high, and ayed as good room volume, the sur- ce is quite inaudible. At all times it clean, and although neither bass nor ble is fully extended, its balance is propriate to its general position in ace.

Everybody will like this fine disc.

★ ★ ★

GROFE — Grand Canyon Suite. 'layed by the Philadelphia Orchestra onducted by Eugene Ormandy. Cor- onet KLLS591 (Stereo).

The history of the Philadelphia Or- estra is remarkable not only for itself t for the impact it has had upon re- rding from the earliest days of the ectrical process.

It soon established itself as the glam- r band number one. Who can for- t the richness of its cellos in the days nen the 78s were supreme, and the g step forward in standards of real- n which it represented?

In later years the efforts of recording gineers to gild the lily rebounded to a large extent both on themselves and on the players, for in their emphasis on gorgeous sound they discounted many performances into little more than spectaculars.

I have a feeling that stereo will change all this, for with the new possibilities in space and distance, much of the justification and reason for the old mike techniques have gone.

In this regard I fancy there will be a levelling out of standards among orchestras. We will be hearing more of their actual characters than of the ingenious tehcniques wich every recording company developes in search of the illusion we are now able to approximate so much more accurately.

I couldn't help these thoughts running through my mind as I listened to this first stereo disc of the Philadelphia.

There are no larger than life excursions or over-ripe diversions here; by contrast the music seems if anything under-stated.

What we do get is a fine band of players in a most competent and colorful version of what is destined to be one of America's constitution favorites and, for all the carping remarks of critics (mostly non-American), one of its most factual pieces of programme music.

It seems strange to say that I would have liked a little firmer bass to balance up the rest, for bass in reproduction was one of the things we always looked for from the Philadelphia.

But that's the kind of recording it it, and a safe satisfying mid-course in acoustics, something which Columbia, who made the original, have always announced as their aim.

The stereo is of the solid type, well filled in the centre, and with no more separation than would be normal when hearing a large orchestra at fairly close quarters.

The surface on the first side of my copy is virtually perfect, and very little inferior on the second.

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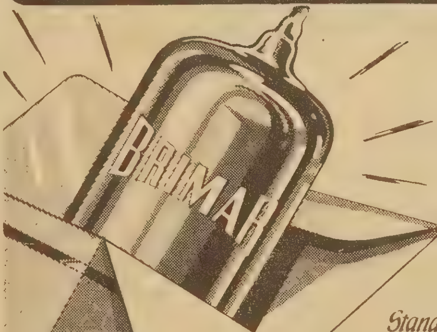

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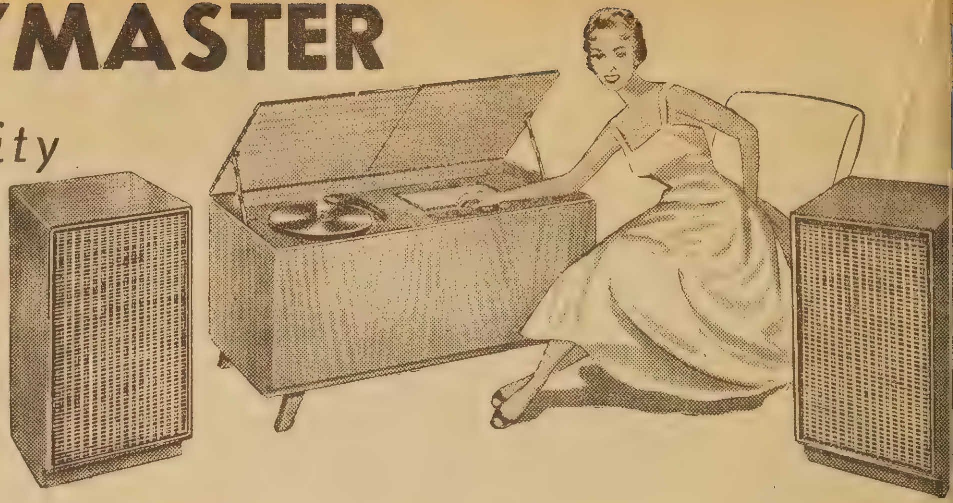

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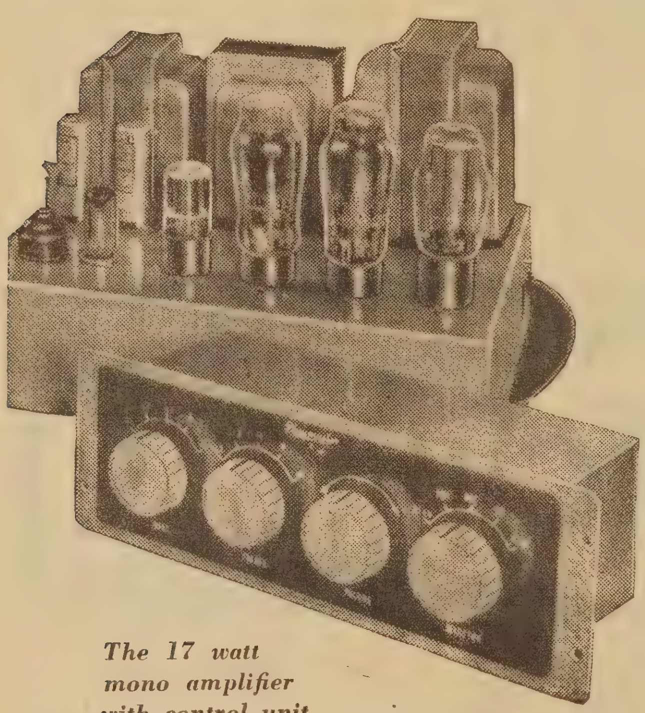

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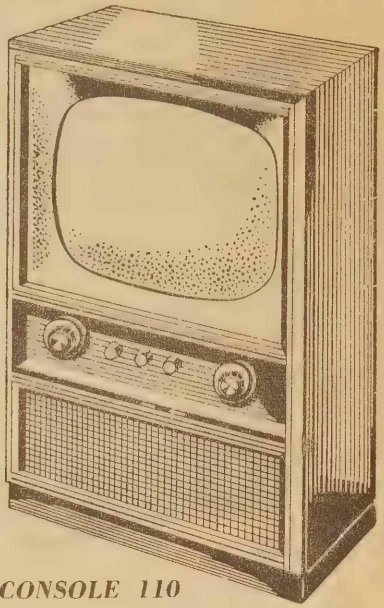

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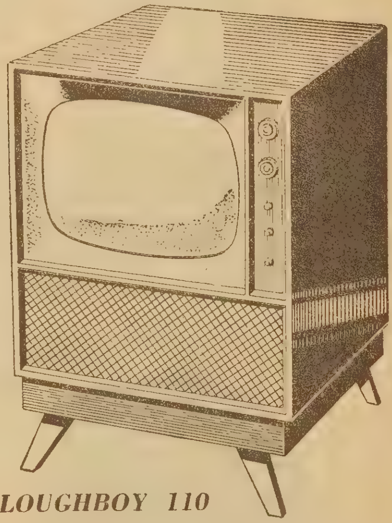

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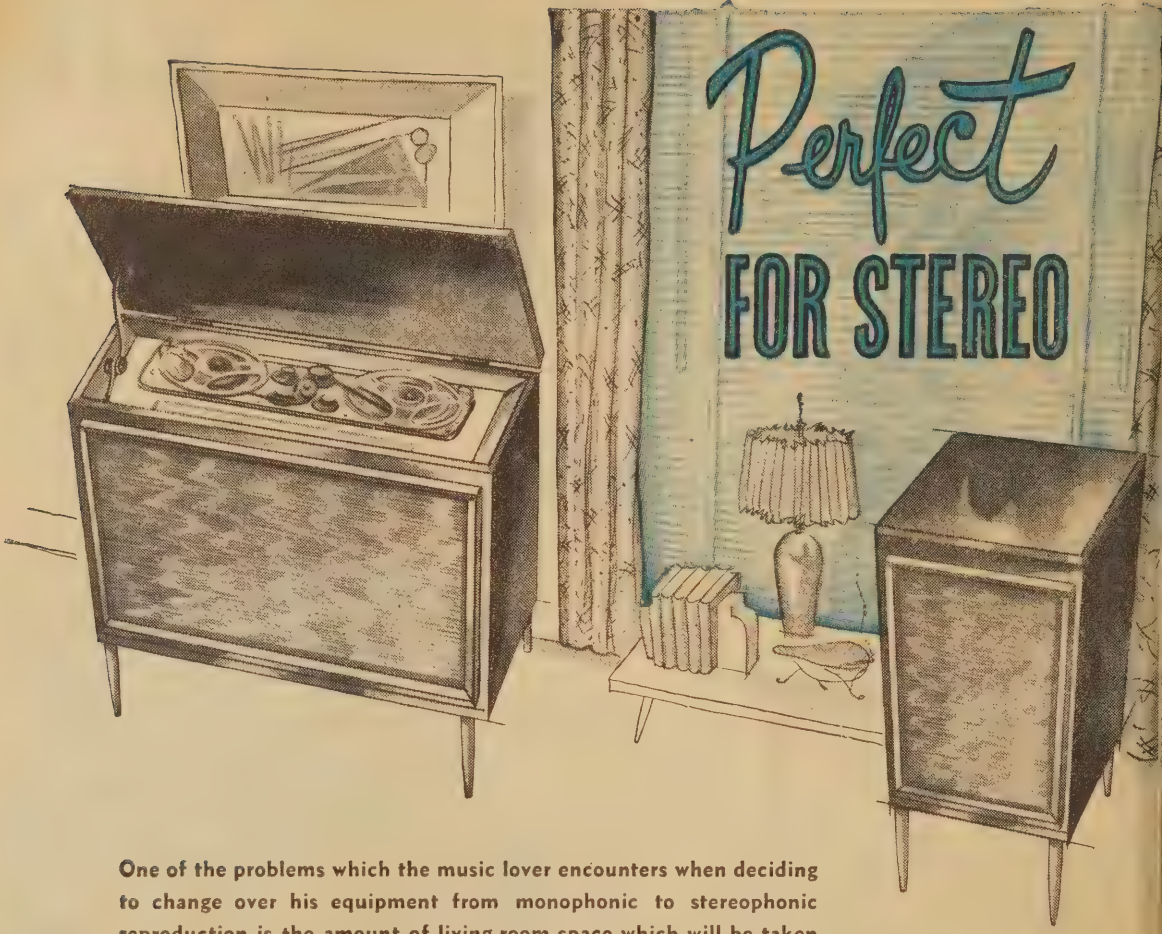

One of the problems which the music lover encounters when deciding to change over his equipment from monophonic to stereophonic reproduction is the amount of living-room space which will be taken up by an adequately baffled loudspeaker for the second channel. Besides seriously encroaching on the floor area, the conventional size enclosures required for 12 inch loudspeakers also introduce placement problems which can prevent good stereo reproduction. It was to overcome these drawbacks that Rola developed the new 8 inch Model 8MX and designed a compact enclosure for use with it.

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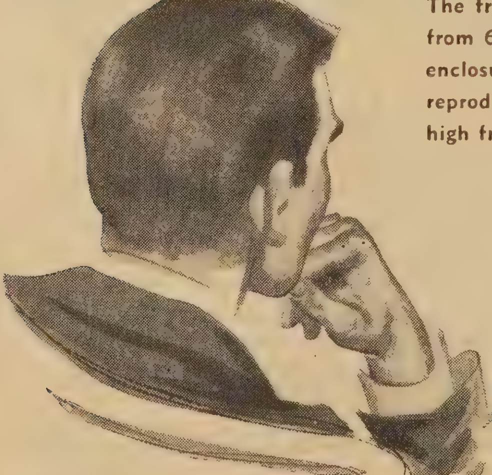
Full details of the 8MX and constructional information on the Rola-designed vented enclosure for use with it are available, free and post free, from the Sales Department, Rola Company (Aust.) Pty. Ltd., The Boulevard, Richmond, E.1, Victoria.



WANA A—More Exotic Sounds Arthur Lyman. Hifirecord 08 (Stereo).

shivering, shuddering, earth-split-uake—untold might from the fiery of this planet. The ash of molten ills the air. The moving tide of ike liquid fire consumes all liv-ings in its wake. Awesome, vi-y beautiful, primitive, the great ıo—" Wow! I can't go on. Read cket note for yourself.

ords from this company have al-been vivid, but none more vivid ve have here.

success does not lie alone in bril-ound and high lights, but decidedly minor keys and the fascination ange harmonies and effects.

s, to be honest, a synthetic mix-ɔf the Islands, which, of course, Hawaii. But the themes, even as well known as La Paloma, uena and, believe it or not, Schu-Serenade, don't sound the way you ed to.

v such a strange collection ever gether for this purpose I'll never but to Arthur Lyman that isn't tant.

ISTIC SOUND

vasn't to me, either, and I haven't ot over an undisguised admiration yone who can shoot such realistic ving sound into the air.

list of odd and not so odd instru-which tinkle, crash, rattle and so support of xylophone, bass, piano, and drums is as long as it is, but many will be familiar to of the percussion music, which is so freely today.

Chinese bamboo flute and moon however, are not so common.

engineers have made this a spec-r rather than a factual recording, ich three dimensions are present at each side and one in the mid-separation is used to project the s with added point, and a virtually surface gives them that quality ceptive reality so that at times vill have an uncanny feeling that re there in person.

show off the response and subtlety ur equipment, this is a fine re-

* * *

ROKOFIEV—Scythian Suite—é For Three Oranges Suite. yed by the London Symphony hestra, conducted by Antal ati. Mercury SR90006 (Stereo).

s is the first serious Mercury I heard in stereo, and I am im-d with it.

with so many stereo discs, par-ly from America, it was made three channels mixed together to the two needed for cutting the

s approach seems to have become rd quite widely, and I think has possible advantages over methods adhere to two channels through-

ybe recording engineers can put ght about this, but in an illusion-rocess such as stereo, it could be ake to adhere too strictly to theo-two-channel ideas for conditions which the necessary perfect play-is rarely if ever possible.

I cannot see any objection to "improving" the sound in this way. The object after all is to obtain the necessary effect through two channels in the playback—there is no implication, except a pedantic one, which says that more than two channels in the recording is cheating

As a matter of fact, best playback under certain conditions by using some of each channel to create a third has much to commend it, and was, in fact, suggested in these columns some years ago before stereo discs were thought of —at least in public.

CONVINCING REALISM

At any rate I can report with honesty that, particularly in the Love For Three Oranges, the spread and realism of this orchestra is most convincing.

Time and time again I was impressed with the presence and positioning of instruments over a wide area. Separation has been handled with skill and even when placement to either side was most pronounced I felt at no time that it was out of place, no matter how deliberately it was done.

The degree of cutting amplitude, frequency response, particularly in the bass register, and the subdued surface made me rejoice to see one more label in which problems are being solved.

Both these works are now well enough known to make further comment about them unnecessary. I had thought the Scythian Suite might have come off best, but it is shaded by the reverse side, although both are good.

To be honest, there were a few surface clicks, but they were not bad enough to spoil my considerable enjoyment of two fine performances.

* * *

TCHAIKOWSKY—Concerto No. 1 in B flat minor, Opus 23, for Piano and Orchestra. Played by Van Cliburn and a Symphony Orchestra conducted by Kiril Kondrashin. R.C.A. SL16142 (Stereo).

This is the version of the concerto which has been receiving rave notices from over the Pacific, together with the full treatment in publicity about its achievement as a recording—its difficulties and its triumphs.

I have not heard it before, although the mono version was released some time before this, the stereo counterpart.

Whether both versions were extracted from the same miking I do not know, but it can be taken for granted that the same characteristics will be found in each.

Its main virtues lie in the dynamic treatment given by both the orchestra and the pianist.

I doubt whether there has been a more vital recording made to date, not even in the heyday of Horowitz, who, despite his hammer-like technique, didn't achieve vitality of this brand.

One can almost see the sparks fly and feel the electrical contact and tension which run through it. Even the more gently graded second movement is but an interlude before they are all at it again, to dissolve just short of exhaustion in their own bravura of sound

But it is not just noisy, although it is a pretty rowdy concerto. In fact it

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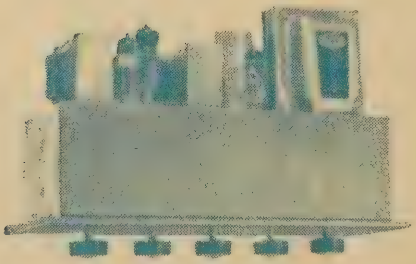

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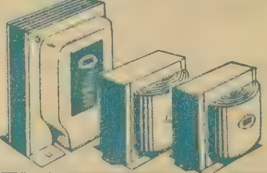

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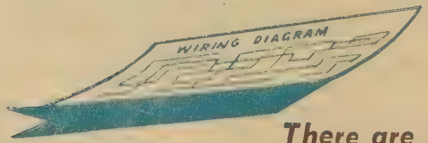

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at a pace which is slower than
as though the pianist was deliber-
ountering the general tendency to
as much noise as possible.
yet it moves forward all the time,
ly pauses sufficiently to expand in
it is a lean and thrusting perform-
which penetrates the mind rather
illing it with a broad stature. In
anner it is undoubtedly magnifi-
and the conductor must take full
in helping to create the final result.

recording inclines to be over-
ing, the piano tone flattens in
loud passages, and it picks up a
uzziness in quieter moments which
eticulous might note. The surface
rage, noticeable mainly because of
ide dynamic range which some-
reduces the sound to a very low

when you hear it you will have
iculty in appreciating why so many
ecome excited about it.

* * *

**ETHOVEN.—Symphony No. 7.
major Opus 92; Fidelio Over-
Opus 72b. Played by the Chicago
hony Orchestra, conducted by
Reiner. RCA SL16172 (Stereo).**

re are so many Sevenths around
moment—I have three awaiting
right now—that comparisons are
too time-consuming to make, and
pointless, in view of the range
recordings.

vever, as this is the only one in
and the stereo places it in so
nt a class, it's hardly worth while
to assess it against mono discs.

I can say straight away that, as
I am concerned, the stereo is
the most valuable thing about it,
ly because it sounds so much bet-
r it, but because it shows what
n expect as more such works come
stereo.

v perhaps I have a stereo ear or
e-occupation with it has made me
stereo-minded than most.

although there are other record-
would not want to throw away
atters of interpretation and his-
interest, none of them sounds
ng but pathetically flat when stack-
against the stereo.

n't mean to indicate that this is
he best stereo of the day—there
nough material of this kind yet
ole to be dogmatic—but the terrific
vement in size, atmosphere and
t are irresistible.

ATMOSPHERE

the first time I got the feeling
bigness of Beethoven because I
ee from the necessity to hear con-
ted loudness when I should have
hearing a big orchestra spread
the room, as the advertisements
t. I heard the interplay of instru-
and counterphrases separated by
e, instead of being manipulated
crophone placement, and I realised
o many of these grand works have
even at the best, far from satisfy-
the past.

ould not say that this is an out-
ng interpretation. It is honest and
but there isn't the magic of a
nini or the grace of a Walter to
rd.

ould say that the stereo plays a
n too much on separation—one
need to be fairly close to the
tra to hear so distinct a division at times—but it's only enough to be noticed.

Against this there are many examples of quite subtle placement of sounds, of which only careful and continued listening could justify close comment.

The Fidelio follows a similar pattern, but I thought the symphony the more successful item.

You will miss the sharp definition of all orchestral sections which many of the best mono records have achieved, for there is pronounced reverberation and a concert hall collection of sound fusion.

But for its stereo and its general good quality you should hear it if you can.

The surface is quite good by stereo standards—a few clicks are not very significant at normal room volume.

* * *

TCHAIKOWSKY. — Romeo and Juliet (Love Theme), Waltz from Serenade for Strings, Sixth Symphony (Theme from First Movement). Played by the Philadelphia Orchestra, conducted by Eugene Ormandy. Coronet KGC 135.

TCHAIKOWSKY.—Cappriccio Italien Opus 45. Played by the Philadelphia Orchestra, conducted by Eugene Ormandy. Coronet KGC130. DUKAS—the Sorcerer's Apprentice; WEINBERGER—Schwanda the Bagpiper (Polka). Played by the New York Philharmonic Orchestra, conducted by Dmitri Mitropoulos. Coronet KGC 134.

GOUNOD.—Faust Ballet Music. Played by the Metropolitan Orchestra Association of New York, conducted by Fausto Cleva. Coronet KGC 138.

Being mainly excerpts from previously released 12-inch discs, all these are lower priced versions giving less and more selective music for less money.

This device of Coronet's allows the buyer to hear good performances by famous combinations, and the purchaser need have no worries on that score.

As so often happens when reducing recordings to the smaller discs, there is a pronounced drop in cutting amplitude when compared with the 12-inch originals, some of which were outstandingly good in this regard.

But because they won't normally be selected as the preferred media for high quality equipment, this point isn't likely to be very serious.

Nor possibly is the fact that the bass appears to be somewhat reduced in the transfer, again on the probable assumption that it won't be missed.

My impression is that, in the absence of direct comparison, it won't be, although the larger discs have definitely more weight and authority.

Nor will the music lovers, with their full-sized recordings, mind the extraction taken from Romeo and Juliet and the Sixth Symphony, so chosen to present the juicy bits for the less heavy-minded public. The Sixth Symphony ends just before that terrific chord about one-third through the first movement, and hearing it I felt like the man who, after hearing the occupant of the flat above him drop one boot, couldn't sleep until he heard the other one as well.

But, then, I have several Sixths, and can play the whole thing any time I like!

Don't forget these discs run at 33. and not 45.

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TAPE RECORDERS, TAPE, MICROPHONES We have full stocks of recording tape, Ferrograph, Grundig and Tandberg recorders together with a range of microphones for all purposes.

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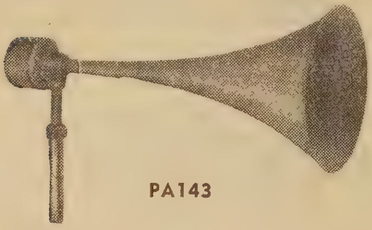
Standard reflex horn speaker for medium distance projection of speech and incidental music.



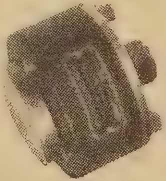
PA143

Short exponential horn speaker for distance projection of speech only.

Ivory timber cabinet with 7in speaker for applications where a bidirectional characteristic is desired.

PA73

RESLO DRIVE UNITS
SU10 & SU12



Exclusive features are the self-locating diaphragm and the concentrically interlocked magnet which together produce an undisplaceable mechanical assembly proof against decentering.

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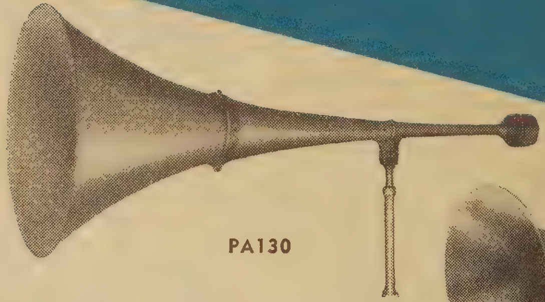
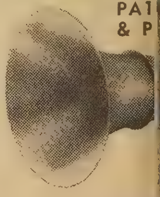
AWA manufacture the most complete range of speaker assemblies—there's a unit for every sound reinforcement need. AWA design these speakers for maximum faithfulness in sound reproduction. Styles and finishes are available from stock or designed for individual use and circumstances.



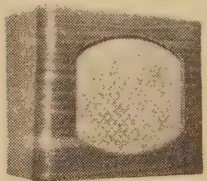
PA130



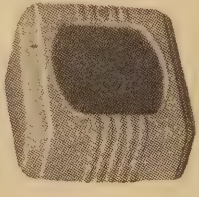
PA1
& P

Standard exponential horn speaker for public address where distance projection of speech and incidental music is required.

These flare baffles are for use with 7in and 12in permanent magnet speaker units and provide high conversion efficiency.



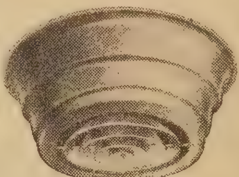
PA77/12PS
Polished timber cabinet for wall or table mounting with 12in cone speaker and 600 ohm line transformer.



PA150/1
Attractive moulded cabinet with 7in cone speaker and 600 ohm line transformer. Suitable for wall or desk mounting. In grey, ivory and walnut.

PA343
General purpos
source reproduc
music and speech
100 to 7,000
Power capability
of programme.

PA218
Designed for overhead mounting in contemporary styling. The unit can be suspended by chain or rod. Gives uniform response over a wide area.



PA188
For overhead mounting this is a surface style unit. 360-degree diffusion over a wide area. In smart styling to suit modern architectural treatments.

PA186
For flush mounti
unit has a
acoustic surround
mounts the compl
sembly above the
line. 360-degree
sion.

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ACHMANINOFF—Rhapsody on
'heme by Paganini, Opus 43;
EG — Concerto in A Minor for
o and Orchestra, Opus 16. Played
'hillipe Entremont and the Phila-
hia Orchestra, conducted by
ne Ormandy. Coronet KLC 2679.

s is the kind of performance one
annot overlook. The Rachmaninoff
bably the biggest and most power-
1 discs, a technical feast, the kind
ng which brings an audience to its
with cheers added to normal
use.

say it is glamorous would be true,
would be wrong to suggest by such
ljective that there is nothing more

glamour is mainly on the orches-
side, and is made up by the record-
much as anything.

s is rich and forward and kind to
numerous highlights which allow
ments and groups of instruments
ove through it in a pattern of
sity.

w it is the strings, now the cellos,
he brass which rise out of the total
like beauty spots revealed round
bend of a musical journey.

d each time we note how beauti-
it is done, how perfectly timed
executed is each sudden glimpse,
our admiration and excitement grow
moves along.

pianist isn't quite so glamorous.
a splendid and purposeful tech-
, he knows exactly what he intends,
he gauges his dynamics and his
al proportions in a masterly fashion.
avoids the overstatement of the
atic which so often spoils this work,
loes he rattle it off to show how
e can go.

say he well deserves the laudatory
notices which are printed on the
, and you certainly won't hear him
ut being moved to some kind of an
nation.

same story in general is true of
Grieg, but here I thought the per-
nce rather too pressurised, and
were too many passages played at
ore for too long.

approach seemed too portentous
work which has much more grace
ar less beef.

wever, if you are more interested
pressive sound you will undoubt-
hail it with the same kind of ap-
l, and there is much to approve

is, I think, is bound to be a popular
l, and the generally good balance
e largely the reason. The piano
through the ordeal of heavy cut-
amplitude most creditably, particu-
in the testing cadenza in the first
ment, where it must be close to
exceedable maximum.

surface is a good one.

* * *

EETHOVEN — Leonore Overture
3, Opus 72a; Egmont Overture,
84; BRAHMS—Tragic Overture,
81; Academic Festival Overture,
80. Played by the New York
armonic Orchestra, conducted by
o Walter. Coronet KLC 536.

quality of these performances is
us from the first note. All are well
and played at concerts as fre-
ly as any others—they are almost
ieces, an excellent guide to a con-
r's outlook and musical under-
ng.

Walter here is completely consistent in his manner; you will have no difficulty in recognising it.

He is one of the old masters and his style is predominantly classical. All the works, therefore, receive the big treatment; there is no question that the voices we hear are those of the mighty.

And the music comes first at all times.

Age has brought no hint of dreariness to Walter. His work is always full of interest and satisfaction.

There is the tendency to vary tempo at times in a manner some might find disconcerting, but it is all done to a pattern which Walter understands very well.

Then there is his custom of lavishing particular care in a quiet and contrasting passage to highlight it against those which he has bustled along for the purpose, and which here I think take some of the total impact from the music.

In the Beethoven particularly these are rugged works, but the less rugged moments should not be allowed to hold them up, even to highlight the vitality which has been built into it. In the Brahms his habit is much more appropriate and gives many opportunities for the strings to show their quality.

But these are minor points in a quartet of notable and distinguished performances. For me, the coupling is singularly well balanced, and on all counts is probably unequalled.

The recording is round and full. Dynamic range is not remarkable, possibly in an effort to include so much music without technical troubles. The sound is not super brilliant, but it is safe and satisfying.

The surface I thought very quiet, particularly on the Beethoven side.

This is a particularly recommendable disc, and in its way historic. The day isn't far distant when men like Walter will have passed from the scene and we will place a special value upon their work.

* * *

BEETHOVEN—Symphony No. 6 in F Major (Pastoral) Opus 68. Played by the Vienna State Opera Orchestra, conducted by Hans Swarowsky. World Record TT 18.

The performance is just about as standard and straightforward as one could wish for, and as such it is a very fair representation of how the symphony should be played.

In the main its tempo is brisk; in fact, compared with the slowest version of all it is a racer!

But, on the whole, I would say it is a conscientious effort, with no real points of criticism or others of exceptional praise.

The sound is clear, but both frequency and dynamic range are limited by comparison.

A bit more bass would have improved it no end, but apparently there is a cut-off about it, for boosting made little difference to the sound.

The loud passages, and, in particular, the sudden crash in the storm movement, are noticeably restricted in their impact, so much so that I think it is a legitimate point of criticism.

Nowadays we can take much more beef than we get here.

Otherwise its a pleasant record and its surface is a very good one.

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Heads with sapphire styli	8	13	5
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Tubes of 5 sapphire styli	1	17	1
Tubes of 2 sapphire styli 78 only		16	0
Diamond styli each L.P. & 78	9	19	10
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5 per tube	3	4	6
2 per tube	1	6	5
Turntable mats rubber	1	2	0
Turntable mats Neoprene	1	3	4
Single shield input Transformers	4	13	7
Triple shield input Transformers	8	5	7
Head Rest with Base		7	6
Duode Loudspeakers			
12in	38	16	0
8in	15	0	0
Pre-amplifiers Type 4	34	10	0
Amplifiers (23 watt Ultra Linear)	85	0	0

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SHORT-WAVE NOTES BY ART CUSHEN

FLASHES FROM EVERYWHERE

BURMA Broadcasting Service at Rangoon has apparently moved its frequency from 6035 Kc to 6015 Kc, according to reports. The broadcast in English, which includes a news bulletin at 1.00 a.m., is the concluding portion of the transmission and the station normally signs off at 1.20 a.m.

The drop in frequency has resulted in interference from the Tokyo transmissions of United Nations Command, which also uses the 6015 Kc frequency. Our observations find the interference is rather severe for the period on which both stations operate, but after 1.20 a.m. the Tokyo transmission is free from interference though at times jamming is directed at its broadcasts.

GOA, which has operated for several years from the territory of Portuguese India with programs directed to India and Ceylon, is reported off the air pending the installation of new high-powered equipment.

This project has been pending for many years, and it will result in the better reception in this area of this somewhat difficult country to receive. The Goa transmissions in the past have been verified on 9610 Kc. Higher power should do much to give the listeners in India a commercial program, and at the moment they are depending on Radio Ceylon for such a service. The new Goa station should be on the air shortly when the replacement of the equipment is completed.

PERUVIAN station OAX6E, which transmits from Arequipa, has been observed in New Zealand on the new frequency of 6200 Kc. The station is assigned the 3290 Kc channel, but has been heard on the new outlet to 3.15 p.m. at good strength.

At this hour the broadcasts of Paris Inter in France uses the same frequency resulting in the covering of the transmissions from Peru. Signals before this time are good with the slogan "Radio Continental" Arequipa being frequently heard. This station formerly was in the 49-metre band on which we have confirmed its reception some time ago.

ABADAJAN station in the Ivory Coast which is using the additional frequency of 7215 Kc has been heard in Europe from 4.30 to 6.00 p.m. The station also uses the frequency from 10.15 to 11.30 p.m., and from 3.30 to 8.30 a.m. This appears to be a new transmitter, the old frequency in the 60-metre band is still using 4940 Kc for the transmissions at the same hour.

CONAKRY in Guinea which uses 4910 Kc has been heard with much stronger signals in Cyprus which is thought to indicate a stronger transmitter on the frequency. The broadcasts are now heard over the Rhodesian signal on the same channel. The Guinea station has news in French from 6.00 to 6.15 a.m.

SABC transmissions on 19 metres have been received at good strength in Europe, when using 15,200 Kc. The broadcast in English is heard on Wednesday, Friday and Sunday and English is heard from 3.00 to 4.00 a.m. The station has news at 3.15 a.m. Other days the transmission is in Afrikans, and the frequency of 25,800 Kc is also used in chain.

LOURENCO MARQUES has been heard on two frequencies with English news at 3.00 a.m. At this time the Mozambique station is using 4840 and 7250 Kc.

SPANISH regional transmissions on 12,020 Kc have been identified as Radio Nacional de Espania at Coruna. The station carries a relay of the Spanish broadcasts of Vatican Radio from 6.45 to 7.00 a.m.

GABON in West Africa is to operate a short-wave service shortly, according to a report from Liberia. The Gabonese Premier has signed an agreement in Paris for a 4 Kw transmitter, which will be in operation before the end of this year. The station plans to effectively cover Spanish Guinea, the Southern Cameroons and the Brazzaville area.

SEYCHELLES which has been verified by a New Zealand listener using the low power of 40 watts discloses its transmissions are 1.15 to 2.15 a.m. each day. Radio Seychelles uses 4990 Kc and the station each day, except Saturdays carries a relay of the B.B.C. news at 2.00 a.m., which is followed by local announcements. The station also carries personal messages to other islands which are at times broadcast in French. The programs are generally of B.B.C. transcriptions.

TANGANYIKA has added the additional frequency in the 60-metre band, which should be possible to hear at the moment. The station at Dar es Salem, uses 4846 Kc, is heard in Europe in parallel with 5050 Kc to 4.15 a.m. at which time it closes. Transmissions are then only carried on the 5050 Kc outlet, and this station closes at 5.30 a.m. at very good level.

CAMBODIA lists new frequencies according to a verification from the station, and 4900, is the latest to be put into service. Radiodifusion National Khmere Phmon Pemp, Cambodia, uses four frequencies 7183, 6090, 4900 and the 1410 Kc medium-wave channel

LATIN AMERICANS DOMINATE LISTENIN

Reception of both the afternoon and evening signals from Latin Ameri has been the highlight of listening over the past few weeks, as ported by our readers and from our own observations.

AS can be expected during the winter months the reception of Latin American signals reach their peak in the afternoons and they will continue to be heard for a few weeks yet.

The new Guatamalan station TGHC "Radio Universal" in Guatemala City is one of the strongest in the 49-metre band and is heard on 6140 Kc to sign off at 3.00 p.m. The station has a program which is dominated with English recordings and when it closes plays a four-note chime several times before leaving the air.

Signals from El Salvador have been received over station Y3MA, which uses the frequency of 6180 Kc. This station has typical Central American programs with many marimba numbers, but at 2.30 p.m. when the B.B.C. opens in its European service, the signal is covered by London. YSMA has the slogan "La Voz Supremia de Occidente" and broadcasts from Santa Ana in El Salvador.

Another strong signal from Colombia is the broadcast of HJKJ which uses the frequency of 6160 Kc. This station which has the slogan "Emisora Nuevo Grande" is a member of the R.C.N. Network, "Radio Cadena Nacional" and these two slogans are frequently given during the broadcasts. Many commercial programs are featured, with the usual recorded commercial announcements and the station carries news at 3.00 p.m. with the sign off at 3.15 p.m. with the Colombian National anthem. The station uses the well-known tune "Just a Song at Twilight" for the theme music both before and after the news session. The signal does not suffer from the interference noted on many of the other Latin Americans heard at this hour, when frequent signals from Europe also occupy the band.

Chilean station CE619, which is broadcasting from Santiago, has been observed on 6190 Kc. The station closes at 2.10 p.m. and has a news session at 2.00 p.m., while the familiar chimes of this station and its other network affiliates is used on closing. Nearby on 6195 Kc two stations continue to be heard. On most days the signal is from HJEZ "La Voz de Cali," but on Sundays the strongest transmissions come from Radio Continental in Sao Paulo, Brazil. Both these stations are received at the same strength but the Brazilian which broadcasts to 3.00 p.m. on Sunday is normally the better signal on that day.

XEWW on 6165Kc.

THE Mexico City station XEWW, whose signals we have been reporting in the 49-metre band, has finally settled on 6165 Kc. The station has been heard in New Zealand at good strength, but at 3.15 p.m. the Swiss transmitter at Berne opens on the same frequency and further reception difficult.

The XEWW transmissions include ne Spanish at 2.45 p.m., and the call of the in the network, XEW and XEWW ar heard. The transmissions of XEWW a heard on 9500 Kc. Signals on this frequer better received, as this transmitter has be most reliable signal from Mexico for many

All other stations in this country are of power and reception of them is very spa The station is reported to leave the air p.m., but the frequency of 6165 Kc is by the Berne station throughout the entire of the broadcast.

Special broadcast from Lima

INFORMATION from Radio Nacional ir indicates they are now using a new beam aerial for a transmission beamed to which is on the air from 3.00 to 11.00 a. station is using the frequency of 15,15 Reports on the reception of the broadcast quested and should be sent to Radio N del Peru, Av. du Petit Thouars 447, Lima The station promises verification of this mitter, which we presume is the transmitte the callsign OAX4T assigned.

CXA3 on 6075Kc.

ONE of the seldom heard countries of America, Uruguay, this month has beer with good signals in the early evenings. broadcasts from CXA3 using 6075 Kc hav noted at 7.30 p.m., after which a progr light music is played to 8.00 p.m. hour the well-known "Land of Hope and is presented, by a band, and then a prog news follows. At 8.30 p.m. signals are ning to weaken, but at this time a prograr mary has been given.

The station uses the slogan "Radio and broadcasts from Montevideo, the cap Uruguay. No interference is noted on the cast, which should be clearly heard thr this area for the next few months, but summer signals are expected to weaken c ably.

4VE moves to 6000Kc.

THE missionary broadcaster in Haiti, has moved its 49-metre transmitter fro to 6000 Kc. Broadcasts on this new fr are much better received as the old chann one also used by a Peking transmitter. power of this Haiti station was formerly 5 but has been increased to 400 watts w frequency change.

Our best reception has been at 8.00 p.m. on Saturday evening the well-known tran program, "Back to the Bible," is presente program continues to 8.30 p.m. when an for letters is made and the station ident 4VEH at Cap Haitan, Haiti.

The station is operated by the Orienta sionary Society and its other frequencies on 9628 and 4VWI on 11,850 Kc also ca program at this hour. The station as r recently in this page plans to ultimately m 4VE transmitter to 5010 Kc.

Taiwan using 17890Kc

THE popular "Dragon Show" from Tai been observed on a new frequency its transmission from 10.30 to 11.30 p.m Taipeh station has been using 7234, 11,815, 17,775; 17,890, Kc. The power of the mitters ranges from 25 to 50 Kw. The the new 16-metre band frequency has be served in the English transmission at 8. to 9.20 p.m.

This broadcast is beamed to this area a program in English when the station co the air, and it is normally heard best 7234 Kc frequency. The reception of b 16-metre frequencies has been poor country due to the severe jamming, w heard on the adjacent channels.

News from readers should be sent to Arthur Cushen, 212 Earn Street, Invercargill, N.Z. All times are Australian Eastern Time.

ANDORRA which has been the subject of controversy about reception on 6305 Kc now advises this frequency is in use, and the power is 1,000 watts. The station has been observed at 6.00 a.m.

BRAZILIAN station Radio Gazetta, Sao Paulo, has returned to short wave and uses 15,325 Kc, 8.30 p.m. to 7.00 a.m., 9685 Kc, 1.00 a.m. to 2.00 p.m., and 5955 Kc, 9.00 p.m. to 2.00 p.m. The station has the callsigns of ZYR226 (5955), ZYR227 (9685) and ZYR228 (15325).

FRENCH GUIANA station Radio Cayenne, is now using 6110 Kc, and the first transmission from 7.00 to 7.30 p.m. should be possible to hear. The station also is on the air from 12.30 to 5.00 a.m. and 8.30 a.m. to 1.00 p.m. This is the only Latin American country we have not as yet heard, and we presume many of our readers will be listening on this frequency to hear this station now operating on a schedule which would make reception here possible.

MOROCCO has made the announcement that other than the Radio Moroc national stations, all other stations will close by the end of this year. From this we presume that the many Tangier stations such as the Voice of America. WTAN and Radio Tangiers will be affected

AMATEUR BANDS WITH BILL MOORE

he Remembrance Day Contest is conducted by the Wireless Institute of Australia and for l years has been held annually in memory of radio amateurs who fell in World War II.

the best supported of all Australian con-
s, and is run on the weekend nearest the
sary of VP Day, August 15, in memory
tralian radio amateurs who gave their lives
ir country during World War II.

names and call signs are engraved on
phy awarded annually to the division of
.I.A. whose leading competitors compile
ghest score, which is adjusted in accord-
ith activity in that State.

eurs throughout the Commonwealth are in-
o participate.

objects of the contest are for amateurs in
all area (this includes those in Australian
ed Territories and Australian Antarctica)
tact amateurs in other call areas (VK1
K2 are considered to be one call area).

date of the contest is August 15 and 16.
n—from 1800 E.A.S.T., August 15, 1959.
E.A.S.T., August 16, 1959. A period of
utes silence will be observed by all stations
gust 15 immediately prior to the start of
ntest.

ng this period an appropriate broadcast will
e from VK3WIA and relayed by Divisional
.

:—

here shall be four main sections to the
:

ansmitting Phone.
ansmitting CW.
ansmitting Open.
ceiving Open.

l Australian Amateurs may enter the con-
ether their stations are fixed, portable or
but only members of the WIA are eligible
ards. Portable/mobile operation is defined
smitting, and/or receiving equipment which
connected to any private or public power
or plant.

l Amateur frequency bands may be used,
cross-band operation is permitted.

mateurs may operate on both Phone and
ring the Contest (e.g. phone to phone, CW
or phone to CW and vice versa) but
bmit an entry for only one of the above
listed in Rule 1.

pen log will be one in which points are
for both phone and CW Transmissions.

ntestant transmitting on phone but receiv-
CW may still enter for the phone section
ce versa). Refer to Rule 11 concerning
logs.

nly one contact per station per band is
and arranging schedules for contacts on
ands is not permitted.

ly one licensed Amateur is permitted to
any one station under the owner's call
Should two or more operate any particular
each will be considered a contestant and
ubmit a separate log under his own call

stants operating stations other than their
ill be referred to for the purpose of these
"substitute operators." Their operating
re will be as follows:—

Contacts: Substitute operators will call
emembrance Day" followed by the call
the station they are operating and the word
ollowed by their own call sign.

Contacts: Substitute operators will call
de" followed by the group call sign
ng the call sign of the station they are
g. an oblique stroke, and their own call

stants receiving signals from a substitute
will qualify for points by recording the call of the substitute operator only.

7. Entrants must operate within the terms of their licence.

8. Cyphers: Before points may be claimed for a contact, serial numbers must be exchanged and acknowledged.

Serial numbers are arranged as for WIA contests, RST and three figures for CW and RS and three figures for Telephony.

9. Entries must be set out as shown using one side of the paper only. Entries must be postmarked not later than September 6, 1959, and addressed to the Federal Contest Committee, WIA, Box 371B, G.P.O., Hobart, Tasmania.

10. Point Scores:—

For contacts VKO to all other VK State areas 6 points.

For contacts VK1/2 to VKO — 6 points, to VK3 — 1, VK4 — 2, VK5 — 3, VK6 — 5. VK7 — 4, VK9 — 6.

VK3 to VKO — 6 points. VK1/2 — 1, VK4 — 3, VK5 — 2, VK6 — 5, VK7 — 4, VK9 — 6.

VK4 to VKO — 6 points, VK1/2 — 1, VK3 — 2, VK5 — 3, VK6 — 6, VK7 — 5, VK9 — 4.

VK5 to VKO — 6, VK1/2 — 2, VK3 — 1, VK4 — 3, VK6 — 5, VK7 — 4, VK9 — 6.

VK6 to VKO — 6, VK1/2 — 1, VK3 — 2, VK4 — 4, VK5 — 3, VK7 — 5, VK9 — 6.

VK7 to VKO — 6, VK1/2 — 2, VK3 — 1, VK4 — 4, VK5 — 3, VK6 — 5, VK9 — 6.

VK9 to VKO — 6, VK1/2 — 1, VK3 — 2, VK4 — 3, VK5 — 4, VK6 — 5, VK7 — 6.

In addition, a bonus of 25 points may be claimed for the first contact on each call area on 50 mc or above.

11. Logs: All logs shall be set out as shown and will carry a front sheet showing, Name, Section entered, Address, Call Sign, and score claimed. A declaration must be provided stating that the contestant has operated within the rules and the spirit of the contest.

Logs for the Transmitting Sections should show in order, Date and Time EAST, Band, Emission, Call Sign, RST/NR Sent, RST/NR Received, VHF Bonus Claimed, Points Claimed for Contact and a blank column.

Logs for the Receiving Section should show, Date and Time EAST, Band Call Sign Heard, RST/NR Sent, Station Called, VHF Bonus Claimed, Points claimed for Receipt and a blank column.

Rules 12 and 13: Provide that the ruling of the Federal Contest Committee is final and stations may be disqualified for regulation and operating breaches.

14. Awards: Certificates will be awarded to the winners of the Phone, CW, Open and Receiving sections in each call area (Northern Territory will count as a separate call area). Further certificates may be awarded at the discretion of the Contest Committee.

The State to which the Perpetual Trophy will be awarded may be determined in the following way:

To the average of the top six logs shall be added a bonus arrived at by adding to this average, the ratio of logs entered to State licensees, multiplied by the total points from all entries.

Receiving Section: The rules are the same as for transmitting and it is open to all Short Wave listeners in Australia.

Contest times and logging of stations on each band are as for transmitting.

The scoring table to be used is the same as used for transmitting. It is not sufficient to log a station calling CQ and a station heard may be logged only once for each band.

CLUB ACTIVITY GROWS AMONG AMATEURS

A NEW phase in amateur radio activity, a welcome one, too, is the extension of club/WIA section activity to country enthusiasts. For many years the founding of radio clubs was mainly the prerogative of city amateurs, and these were particularly popular and well supported in pre-war years. More recently main activity in the city has centred around the WIA and its extensive section organisation.

In the country during the last couple of years, however, there have been many new clubs or WIA sections formed.

This is a good indication of continuing support and the desire of country amateurs to meet personally rather than to restrict their contacts to the air.

WIA zone organisation provides a valuable contribution to the movement's welfare, but nothing can equal the yarn in person and the fraternal mixing of amateurs.

This change will undoubtedly prove an excellent method for the recruiting of new amateurs, and the policy of the N.S.W. division of WIA will assist on this score.

At a nominal cost the division supplies copies of their AOCP Correspondence Course Papers to club-section members to assist in studies for the amateur licence.

The latest additions to these country amateur organisations is the Albury Radio Club, southern section of the WIA, N.S.W. Division. 20 persons attended the inaugural meeting held in June, and the following office-bearers were elected: President, Noel Arnold, VK2OJ; vice-presidents, Athol Mitchell, VK2JA, and Herb Dixon, VK2QD; secretary, Don Haberecht, VK2RS; assistant secretary, Art Phibbs, VK2EU; treasurer, Bert Moralee, VK2AEM.

The club will meet on Friday nights at the High School. Inquiries with reference to membership can be directed to any of the above officers.

New officers for the ensuing year for the Griffith Radio Club are: President, E. Clare, VK2ZEC; vice-president, M. Bested, VK2AEB: and secretary, N. McNabb, VK2ZCN.

The club is very active and caters for prospective amateurs by conducting an AOCP class.

Quite a number of new calls in the area are as a result of class operation.

The Goulburn Radio Club has now obtained its transmitting licence, VK2ATR. The club's call should be shortly heard on the air.

The Blue Mountains section of the WIA was visited by the State president of the WIA, Dave Duff, VK2EO; vice-president Max Sobels, VK2OT; and WICEN officials Bob Winch, VK2OA; and Max Pleffer, VK2MP, in June.

Dave provided much information on ITU and Divisional Activity, while Bob outlined the WICEN organisation and plans for future net activity.

The State President handed to section president Wal Cromie, VK2MZ, a copy of the SSB tape and diagrams prepared by Joe Reed, VK2JR, and Leo McMahon, VK2AC, for the use of the section.

Visitors from Divisional HQ are an important function of WIA activity, and provide section members with an intimate knowldege of WIA affairs.

The call sign of the Blue Mountains section is VK2AUX.

ish Definitions

British Post Office has defined the maxi-
n transmitter ratings allowed to radio
using S.S.B. The requirement is as

eak RF output from an A3A transmitter
exceed that obtained from the A3 trans-
working at an overall efficiency of 66
. The power shall be measured by the
process:

ply a pure sinusoidal tone to the trans-
nd adjust the input to 150 watts DC;
ction on a cathode-ray tube by the RF
shall be measured.

nput power is the total DC input to the
ircuit of the valve or valves energising
l.)

place the tone by speech; the maximum
on the cathode-ray tube showing the
out caused by the peaks shall not be
than twice the previously measured de-
or the tone input.

ation is also supplied on Frequency
on, earthed or grounded grid power
and pulse modulation.

Mobile in the UK

MOBILE operation on amateur bands is so popular in the U.K. that enthusiasts have formed the Amateur Radio Mobile Society. The main events to be conducted by the society, of course, are to be Mobile Rallies. Members on joining agree that their equipment must be so installed and used so that in no way shall it constitute a hazard to any person.

An indication of the support given these rallies is shown in a recent North Midlands function. One hundred and ninety mobile stations were counted in four car parks and the total attendance estimated at 1,000 persons.

Our winter, the time for overseas National Field Days, sees many stations in the field. A listen over the 7 Mc band on June 28 gave some indication of the support afforded these events. Last year 11,316 Ws, Ks, etc., participated in the event. The band on the Sunday evening was just one mass of signals calling CQ FD. These events call for high technical skill and operating ability if you are to finish among the leaders. Plenty of scope for small and more powerful transmitters and transistor power supplies.

N.S.W. Divisional Meeting

THE June meeting of the N.S.W. Division was well attended and Mr Bob Mondell of the School of Electronics, lectured on Distributed Amplifiers. The subject covered the feeding of a number of TV receivers from a common aerial and associated problems

A special meeting conducted at the conclusion of the normal meeting decided that fees for associate members should be raised to £2. For many years fees for this class of member have been insufficient to cover expenses incurred in supplying the facilities available.

Other than voting powers associate and full members enjoy practically similar privileges, and it was only right that the membership fees should be brought in line.

The N.S.W. Division's honorary solicitor, Bill Clarke, has through the years done sterling work on behalf of members and the constitution, with amendments, should be soon available. Bill, a regular attender at meetings, assists to keep the workings on the correct legal line. He missed the June meeting, an unusual occurrence, there

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- NOW 46 EXPANDED SECTIONS

INCLUDES: Formulae, calculations, electron optics, studio equipment, transmitter power plant, aerials, amateur radio equipment, waveguides, V.H.F. transmitter-receiver equipment, commercial H-F links, navigation and radar, industrial TV, valves, tubes, transistors diodes, interference, magnetic and disc recording, radio and TV installations and servicing, projection TV units — symbols, transistors.

It is impossible to list the very comprehensive contents and expansive sections of THIS NEW OUTSTANDING and AUTHORITATIVE WORK—that's why you are offered a chance freely to examine it in your own home and without obligation. Take your opportunity, POST THE COUPON NOW!

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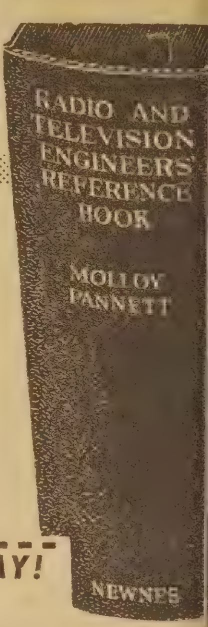
RTE

Place X whe
it applies.

Householder
Tenant
Living with pare
Lodging address



YOU MAY HAVE LIVED ON EARTH BEFORE!

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You wonder why you are living on earth to-day and for what purpose you are here. Certain secrets of life and mental development cannot be divulged indiscriminately. If you sincerely feel the need for instruction in the use of your higher creative endowment, you have reached the stage where the Rosicrucian teachings will be of practical value to you in your everyday life. Learn how to quietly impress your personality on others, to better your business and social position.

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aod reason—he was a proud father on the

not often apparent to the casual observer
ount of work entailed in the duties of
fficials. Some indication can be obtained
st one duty, the revision of the member-
. Secretary Norm Beard, VK2ALJ, QSL
Frank Hine, VK2QL, and bulletin officer
wis, VK2YB, spent twelve hours straight
job. A small portion of the normal
of the year.

Record

ER undoubtedly is not the cure for all
rating ills and the means of raising the
station.

GW3AHN's effort with never more than
input in the DX field demonstrates this
le has now worked 254 countries (246
d) with that power, a mighty achieve-
Two other features of Tom's operating
ly a WAZ award using telephony, a rare
and the second a tally of 230 different
contacted on the 21Mc band.

WAZ telephony award is most difficult
as it is necessary to make two-way phone
to count for confirmations.

iony stations are rather rare in Zone 23
Russian Zones of 17, 18, 19. On the
of awards the RSGB is the only society
cifies a minimum signal requirement for
ficates. A minimum report for CW is
T8 and on telephony R3 and S3.

ord WACs

number of WAC certificates issued by
A.R.R.L. H.Q.s society of the I.A.R.U.
he past year was a record.

f a total of 2,425 posted, 998 were for
y contacts, 100 were endorsed for SSB
16 for 50 Mc contacts and six for 3.5
ievements. It is not generally known
cial certificates are issued for SSB, 50
3.5 Mc working.

Hilliard provides some news of VHF
in Victoria and is as follows: VK3ZDG
3ALZ have stabilised gear on 288 Mc
cing for longer distance contacts. VK7LZ
stal controlled gear on the band and
bridge Bass Strait next summer.

activity from Darwin next summer should
om VK5NE and VK4ZBW who has been
ed to that area.

Channel 9 in Melbourne was reported as
ewed on three occasions in three weeks
ation 20 miles south of Perth.

er at the July meeting of the N.S.W.
nd TV section was Harold Burtoft,
I, his subject, transistors. Many of the
ng are using them extensively in their
ear and further insight into their making
lication was appreciated.

EN Handbook

.S.W. WICEN Operating Procedure Hand-
prepared by Bob Winch, VK2OA, and
fer, VK2MP, is a very instructive docu-

30 foolscap sheets cover all aspects of
and message handling and should prove
e to new members.

rs cover—Operating Rules, Calling and
g, the Message Form, Message Hand-
t Operation, Prowords and Prosigns,
Alphabet and the transmission of Num-

of the Handbook have been forwarded
ICEN operators in the State.

ueen's Birthday Weekend Convention of
'S Queensland Division held at Palm
the Gold Coast was very successful.

any reviews of the previous year's event
ard on the air and served no useful
In all events of this kind, earlier ex-
can assist in the general planning to
future conventions, but a recital of old
can only do harm.

er River Branch

organisation for the Hunter Branch,
W., October annual dinner and field day
te.

nner will be held on Saturday evening
3, and the guest speaker will be Allen
M.H.R., VK2KB. The toast to Ama-
io will be proposed by Ray Carter,
and the reply provided by State WIA
Dave Duff, VK2EO.

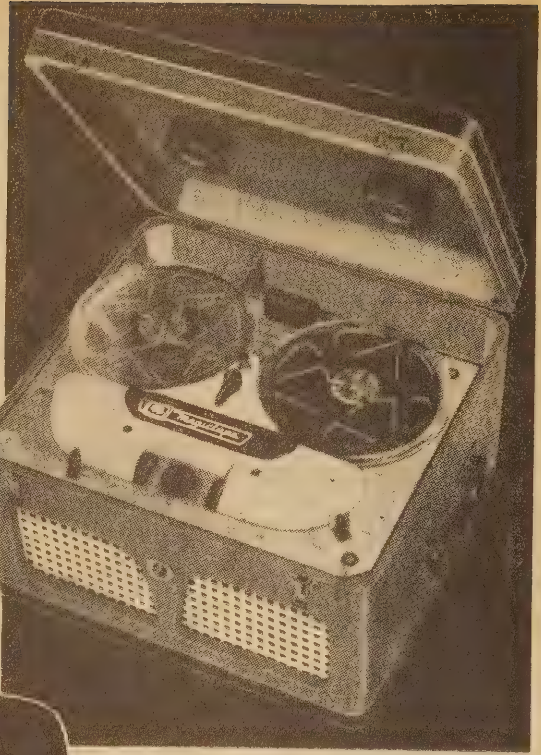
ber of old-timers have been invited to
er, including Joe Reed, VK2JR; Wally
VK2AXH; Bill Ottey, VK2ZL; Ern
K2FP; and George Cowell, VK2SO.

ld day will be held at Blackalls on Sun-
ber 4, and full details will be publicised
r date.

ind Air Installations

acilities available to U.S. amateurs at
and in the air have been considerably
Whilst operating in Region II (North
America) they may use all bands from
148 Mc. However, when they are in
nal waters in Regions I and III they
operate on the 21 and 28 Mcs bands.
l privileges are available for Aeronau-
ile Stations, in both cases the permis-
the captain must be obtained before

now with three speeds and exclusive twin 6" speakers!



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Magictape

RECORDER

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Easy Terms Available

Records anything! Plays back instantly!

Tape Speeds: 1 7/8in per sec. for long speech recordings, 3¾in per sec. general purpose, 7½in per sec. high-fidelity musical recordings.

Dual Track Recordings: Doubles recording time on 7in spool, gives up to 4 hours on 1 7/8in per sec. with standard 1,200ft rolls and 6 hours on long-play tapes.

Two Input Channels: (1) high gain, high impedance for microphone, home radios, TV sound and disc pick-ups; (2) radio tuner input.

Microphone: High sensitivity type to attach to standard microphone stand.

Speakers: Two specially matched 6in A.W.A. loudspeakers for high-fidelity reproduction.

Dual Tone Controls: Two separate controls are included, allowing complete and independent variation of treble and bass registers.

Rev. Counter: For forward and reverse directions; immediate location of any subject matter on tape. Turn knob anti-clockwise to reset at zero.

Fast Rewind: Simple lever control, rewinds full spool in 85 seconds.

Fast Forward: Simple lever control, winds full spool in 95 seconds.

ON/OFF Monitor Switch: Allows program to be checked while recording.

Erasure: Fully automatic A.C. erase on record.

Public Address: Position on function lever fits Magictape for public address unit or portable amplifier with extension speakers.

Foot Control for Stenography: Screw-in socket for control in front of case.

Weight: 34lb.

Size: 15 5/8in x 14 5/8in x 9¼in.

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DIRECTOR OR INSTRUMENT
STAND.

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Each.

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with 0 to 1 mill. meter, multi switch, red light, contactor, etc. £3/15/. Post, N.S.W., 3/6; interstate, 4/11.

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BALL-BEARING

1 3/8in diam., ¼in shaft, 30/ doz.
1¾in diam., ¼in shaft, 42/ doz.
2 3/8in diam., 3/8in shaft, 54/ doz.
3½in diam., 3/8in shaft, 66/ doz.
Add postage.

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BC 906/D, 15 to 23 Mcs.

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OIL PRESSURE GAUGES

New. Suit cars, trucks, boats, stationary motors, etc. 0-150lb per sq in.

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Complete with tubing.
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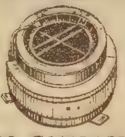

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Guaranteed Correct.

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0 to 15 volt D.C. and 0 to 220 volt D.C., with probes. In waterproof Canvas Case.

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WITH TRIPOD

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MAGNETO

Ex-R.A.A.F. Complete.
12-cylinder, platinum points, adaptable to 4, 6 or 12-cylinder marine, car or tractor engines.

£4/10/

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RECTIFIER

RA88A new, contains 3 valves 6L6, 3 valves 5T4, 2 valves, 150/30, 1 valve GSL7GT, trannie, chokes, aluminium chassis.

£4/15/-

TELESCOPES EX-Army

Ottway of London.
With variable power adjustments.
Length 26in. Weight 12lb.

£12/10/-

Freight payable at nearest attended railway station.

CHASSIS

RT24, TN, B/APXI with 20 miniature seven-pin ceramic valve sockets and covers, chokes, etc.

55/- ea.

GUNSIGHT COLLIMATOR

Contains Acromatic Lens 1 7/8in diam. 4½in F.L., front silvered diagonal eliptical mirror, two worm traversing gears, sundry tubes, connector mirrors, etc.

27/6 ea.

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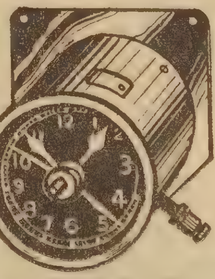

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SMITHS 8-DAY. **£3/19/6**

Ex-Rolls-Royce Merlin. **ELGIN** with sweep second indicator.

£6/10/-

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VALVES, NEW

1R5	12/6	6AG5 ...	7/6
1T4	10/	9006	15/
3A4	12/6	837	9/6
6C4	7/6	83	9/6
6J6	15/		

B.T.118 transmitter valve £3/10/ ea. Add postage.

DRIFT SIGHT

Canada Mk. II contains these lenses: 2 acromatic 1¼in diam. 5in focal length, 1 Bi-convex 2in diam., 9in focal length. 1 plane convex 2in diam., and 9in focal length. 1 small elliptical mirror, minor axis 1 7/16in 1 flat optical front silvered mirror 1¾in x 2 7/8in. 1 4in ground glass disc and sundry parts, etc. 42/6 ea.
Post: N.S.W., 5/11; Int., 9/3.

HEADPHONES

High Impedance. Suit Crystal Sets. Lightweight. American.

22/6 pair

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AIR SPEED INDICATORS

NEW.

8/6

Post: N.S.W., 2/1; Int., 3/3.

WALKIE TALKIE BATTERIES

Suit CSR 536.
One H.T. 103½, one L.T. 1½V.

15/- pair

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MANIFOLD PRESSURE or VACUUM GAUGE

£1 each

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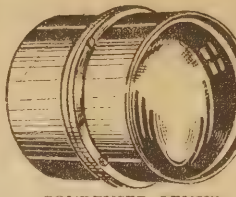

CONDENSER LENSES.
3½in WITH CELL.

£3/15/-

Reflector Mirror, Lens Lampholder, 35/ extra.
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RANGE FINDERS

Horizon and Bubble Type.
Mark IIIB.

Complete with Leather Case.

Dimensions, 9in x 4in x 2in.
Ex-R.A.A.F.

ORIGINAL COST £30.

PRICE 35/-

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TRANSFORMER AND RECTIFIER UNIT

Ideal for relay operating. Input 10v, 240v A.C., Output 41, 57v D.C.

35/-

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2-Way Radio.
No. 22 without power supply. £4/10/.
No. 128, 2 to 4.5 megs. Ideal ship to shore, fire-fighting, etc., £12.

WHIP AERIALS

Ideal for car or TV antennas or blackfish rods. 13ft in 12in sections.

19/6

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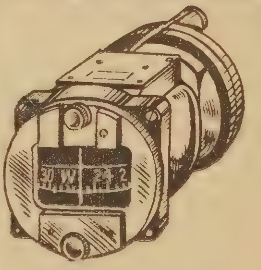

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Small ships. Pioneer American. Liquid Damped with Light. Also suit as car compass.

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Transmitter 2-tier, 15/ ea.
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55/- ea.

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For racing enthusiasts.
12V Bendix new type 512
Platinum Points.

22/6 ea.

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SEARCHLIGHT REFLECTOR MIRROR, 3ft PARABOLIC. Ideal Solar Heat experimenters, Hot-water systems, etc. Also makes splendid Wall Mirror, especially when Fish Bowl or Flowers are placed in front. Has pleasant reflections effect.
Original cost, £80.
SPECIAL PRICE.

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VARIABLE CONDENSEF

10/-

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Mechanical REV. COUNTERS

BENDIX.
New, 0 to 3000 r.p.m

£4/19/6 each

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and driver (522, 160 and 116
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Contain these lenses:
1 Lens 1" Focus ½" di
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1 Filter Lens, 1 Gratic
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18/6 each

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OUTFIT 1E/18/A
BRAND NEW.
COMPLETE.
100 to 155 Mcs.
With 0-1 internal/external meter, tools, battery box, generator and instruction b dovetailed wooden case

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45/-

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BRAND NEW, NYLEX
ROTPROOF COVERED

£4/17/6 per m

Freight payable at nearest a railway station.

DEITCH BROS.

70 OXFORD STREET, SYDNEY Between Crown a Riley Streets, Ci

IO ASTRONOMY SEES TO LIMITS OF SPACE

(Continued from Page 19)

e 9 the signals from Taurus be-
weaken and it was not until June
they faded out altogether, re-
to normal on June 19. The radio
had lasted 10 days as against a
utes for an optical eclipse.

experiments proved that the at-
re of the sun reaches out to at
ght million miles into space as
an estimated 500,000 miles as
an optical telescope.

Pfeiffer points out that if our
ere able to see this radio sun
d appear several hundred times
han the optical sun we see now.

assumed that the sun's atmos-
xtends far beyond the eight mil-
es or so as detected by our pre-
io telescopes. At present we can
this far. When more sensitive
es are made it is not improbable
will find that part of the sun's
ere extends to the upper limits
own and that the periodic out-
of electrical energy such as
and so on are directly due to a
of the sun's atmosphere with
1.

H AND HEIGHT

se of varying conditions of tem-
s, waves transmitted from the
nosphere vary in length accord-
height above the surface of the

se of this it is now possible to
each successive region with a
elescope. For examining the
at a height of 300,000 miles a
gth of 45 feet is tuned in. For
of 120,000 miles a wave length
eet is used. A four foot wave
will examine the corona at a
f 25,000 miles, a 25 inch wave
0 miles and one third of an inch
ns close to the sun.

s made in Khartoum reveal that
ns close to the sun are not uni-
density. One region may have
rature of 100,000 degrees while
adjoining may be only 50,000

a height of from 6,000 miles to
niles above the sun a tempera-
nearly two million degrees pre-

MINING TEMPERATURE

it is that by a knowledge of the
ure at which a given wave
s generated radio astronomers
to determine temperatures at a
of 93 million miles. Conditions
at any given moment in the
mosphere can determine our
or tell us if we are to have
storms or radio interference.
tronomy will help in more accur-
casting of this type of phe-

teresting application of radio
y lies in its use for the naviga-
hips.

been the practice for ships to
r positions at sea by the use of
for observing the sun and stars.

nodern method of navigation
se of the radio sextant which
y and continuously registers the
of the sun irrespective of
the latter is visible or not.

In appearance the radio sextant is like a bowl about three or four feet in diameter. In the centre is a projecting metal rod. When a switch is thrown the aerial moves in a sweeping motion, scanning the sky until it picks up radio signals from the sun. It then automatically locks itself in position and the tip of the protruding metal rod begins to rotate.

The tip of this rod is really a collector of the sun's radio waves which have been brought to a focus by the bowl aerial. This tip rotates about 30 times a second. In doing this it is scanning found the circumference of the sun. As the sun moves the instrument automatically moves with it because the tie-up with the sun's radio signals and the instrument prevents the tip of the collector from remaining outside the radio field. Meters connected with the aerial and located elsewhere in the ship register accurate positions continuously.

This instrument does not work at night when there is no sun. Efforts are being made to make use of radio signals from some other celestial source at night. There is no doubt this will be achieved.

Throughout space there are very many stars which emit radio signals. These are rapidly being charted. Some of them transmit fantastic power. The strongest known source of radio energy is within the constellation of Cassiopeia. It has been estimated that it broadcasts with a power of 10 million-billion-billion kilowatts. Of course so vast is the distance through which these waves must travel to earth that the amount which reaches us is only a fraction of a watt but is nevertheless unmistakably strong.

Throughout the depths of space are millions of galaxies. They consist of milky ways, suns and planets like our own.

Theory has it that these galaxies are receding from us at an amazing rate, that the universe is expanding. These galaxies emit powerful radio signals which can be picked up on our sensitive radio telescopes.

A good radio telescope can pick up signals from a source nearly six thousand-million light years away. In other words the signals which reach us started from their source nearly six thousand-million years ago. Whether these galaxies now exist or whether they have been rendered extinct by some awful explosion we will never know.

With the present rate of development of radio telescopes it is quite possible that we may be able to explore to the very rim of space.

Astronomers believe that there is some place many billions of light years away to which the expanding galaxies have never reached. They believe that some time in the future we will be able to build telescopes which will reach this awful abyss beyond which we cannot "see" because there is nothing there. It merely waits to receive some galaxy which is madly rushing to nowhere.

There are many theories awaiting test by radio astronomy. One is that space is curved which means that if one travelled far enough through the universe one would return to his starting point.

Guided missiles are now being steered by radio signals from space.

Ships are guided by the same means. It needs no stretch of the imagination to see that space travel of the future will rely on radio signals from a known source to guide the space ship on its journey, and radio signals from Earth to guide it home again, we hope.

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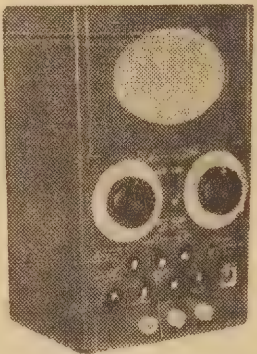

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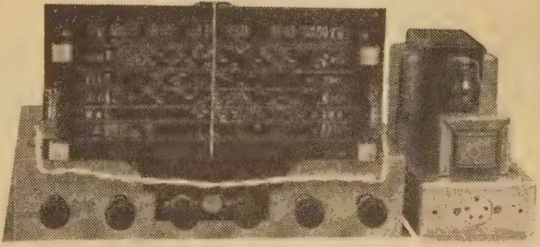

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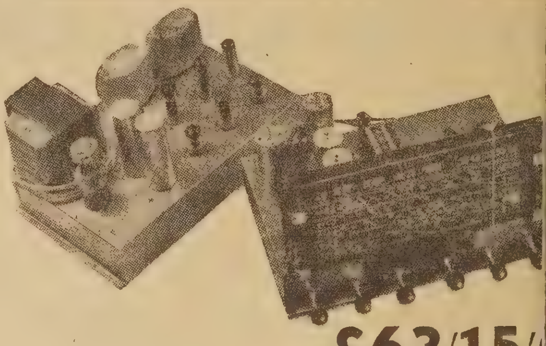

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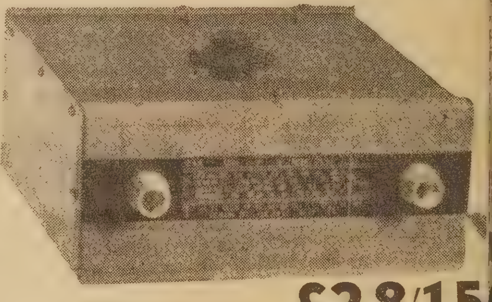

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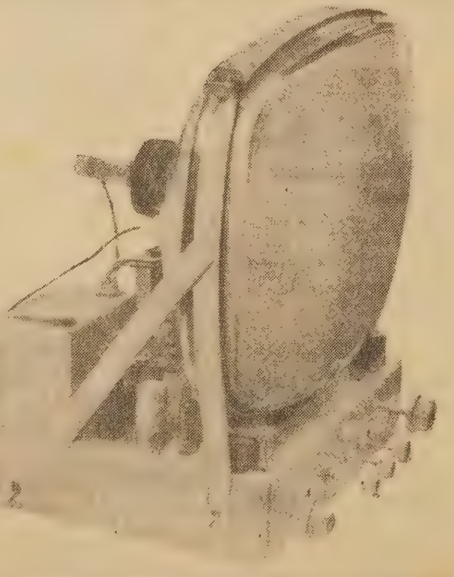

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VHAT TO DO ABOUT STEREO SPEAKERS

(Continued from Page 51)

oth transformers tied together, the e impedance seen by the centre :er is 4 ohms from the left amplifier 12 (16-4) ohms from the right ampli- for a total of 16 ohms. Thus all speakers are correctly matched.

nether you use two or more speak- he problem is still how and where lace them. Ideally, the speaker gement should complement the phone setup used during recording trouble with that is, mike setups widely between studios, and worse each of the studios themselves are antly abandoning one system and ning to another. The one thing doesn't have today is hardening of rteries.

ne possible microphone and com- entary speaker setups are shown in 4. The Jensen Stereo Director will l some of the flexibility required for ging setups, but even so it's almost sary to have the speakers on rollers. mplicating matters further, the mike s shown here are idealised, and n is any of them used in such a form in practice. At the other ex- , we still have the old multiple- setup often used in monophonic ding. But in stereo, each mike nel can be directed to either (or stereo channels in varying degrees for by the director. The result is stereo, fabricated and homo- ed for you.

the same token, the speaker gements are only suggested possibil- to be modified by the acoustics of listening room, your personal pre- ces, and your imagination. This game is just too young for there any hard-and-fast rules, either in udio or in the home. All you can experiment with these ideas until find something that pleases you. like most stereophiles, you will bly rearrange the whole thing next anyhow.

courtesy Hi-Fi Systems No. 5. right 1959 by Fawcett Publica- Inc.

HT THAT DOES NOT FAIL

ORM of lighting that never goes ut and requires no power source p it burning was one of the latest eries mentioned in a recent edition "Science and Industry" program cast weekly in the B.B.C.'s General eas Service. Mr Denis Jones, con- t physicist in the manufacturing nat has developed it in collaboration the Isotope Division of Britain's c Energy Authority, said that the construction of the lamp was a hol- ell, usually of metal, with a glass w on one side. The inner walls glass cell are coated with phos- scent material—usually zinc sul- . The air is pumped out of the which is then fillled with Krypton radioactive form of the inactive rypton, which is a waste product mic reactors.

hough any radioactive material was ential hazard, Mr Jones said, in se of Krypton 85 almost the whole energy was in the form of beta es, or electrons, which could not tside the light source.

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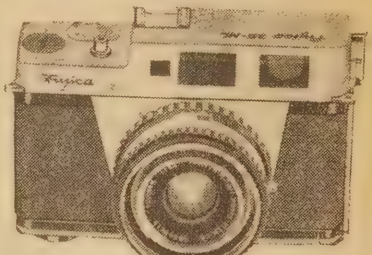

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VALVE SPECIALS! 50,000 New Valves To Clear

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1D8GT	9/6

6A8G	10/6
6K8G	9/6
6SJ7GT	9/6
12K8	10/
6AC7	2/6
EK32	10/6
6SA7GT	9/6
6SH7	5/6

1Q5G	5/
1P5G	5/
1C7G	5/
1K5G	2/6
1M5G	5/
1K7G	5/
1L5	9/6
6AC7	2/6
6C8G	7/6

6SS7	8/6
6H6	2/6
6H6GT	1/6
6K7GT	7/9
6U7G	6/6
6J7G	5/
7C7	3/6
78	7/6

EL32	10/6
6V6GT	12/6
VR65A	2/6
41	7/6
7193	3/6
954	2/6
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EF50	2/6
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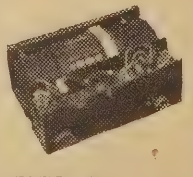
NEW S.C.R. 522 GENEMOTO



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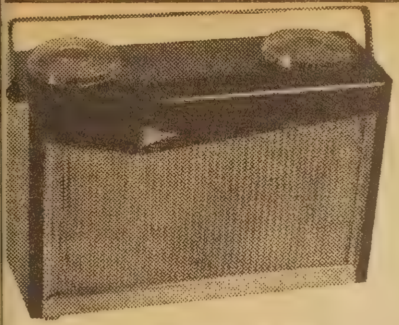
METROPOLITAN RADIO SUPPLIES

332 PARRAMATTA ROAD, STANMORE, N.S.W. PHONE LM739
640 KING STREET, ST. PETERS, N.S.W. PHONE 51-808



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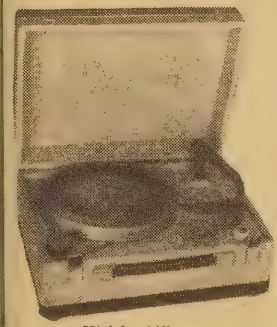
COMPLETE KIT OF PARTS

£26/10/-

Post extra.

SET WIRED AND TESTED £2 EXTRA

Including 6 S.T.C. Transistors, R.C.S. Coilkit with printed circuits, Rola Transformers and 5F Speaker and all parts necessary to complete this Set including attractive and durable two-tone cabinet with gold trim.



Weight 11lb.
abinet size 13in x 10in x 6in.

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Complete Transistor Six kit with B.S.R. four-speed motor and crystal pick-up and attractive two-tone covered cabinet £35

As above, but with Seven Transistor kit,
£37/10/-

Above sets wired and tested. 6 Trans 55/, 7 Trans, 75/ extra.

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Complete kit including B.S.R. Motor and Pick-up (4-speed) and attractive two-tone covered cabinet £25

Wired and Tested £2 extra. Postage extra.

7 TRANSISTOR PORTABLE

Specifications as above but with extra I.F. stage, giving better range and selectivity; also has extra coil for connecting to car aerial, making it ideal as a car set or for country locations. Wired and tested. £3 extra.

£29

Post Extra.

4 TRANSISTOR SET

(As described in May "Radio and Hobbies") Complete kit of parts less cabinet. Attractive two-tone covered cabinet, 47/6 extra.

£13/15/-

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RADIO & HOBBIES TRANSISTORISED CAR RADIO

mplete kit of parts for the car radio as featured in the June issue of R., TV. and H. Parts, including valves, transistors d speaker, £28/15/-. Post extra. Wired and tested, £4 extra.

ONDENSER SPECIALS

xes of 100 new ceramic, mica, paper and ctrolytic condensers in values ranging from pf mica to 5 400v paper. Values include 01, .00025, .00075, .01, .02, .05, 1. Also 0 mfd/12v., 10 mfd/40v., 16 mfd/350v, electrolytics.

25/- per 100.

Post Extra: N.S.W., 2/6; Int., 3/6.

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New Dubilier pigtail condensers.

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Post Extra.

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4in. Per-Mag. Speakers

5T or 7T Trans.

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Post and Packing, 3/6.

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New High-Fidelity 4 Speed Record Changers, Turnover Crystal Pick-up, Sapphire Needles.

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455Kc 1¼in square can. Slug tuned.
4/9 post extra.

LIFEBOAT TRANSMITTERS

20/, plus post.

Complete with Valve and Telescopic Aerial.

New Power Transformers

60mA prim.: 240v with 230v tapping. Sec. 285 x 285 with 6.3v filament winding 60mA.

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40mA prim. 250v. Sec. 225 x 225 with 6.3v Fil. Winding Upright or Flat Mounting. Size 2in x 2½in.

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2/6 Postage, N.S.W.; Interstate, 4/6.

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New carbon resistors, mixed values. Well-known make. 10/ per 100. Post free.

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WITH SWITCH STANDARD SPINDLE	WITH SWITCH SHORT SPINDLE	LESS SWITCH STANDARD SPINDLE	LESS SWITCH SHORT SPINDLE
25,000 ohms 100,000 ohms 500,000 ohms 1 meg. ohm	100,000 ohms. 500,000 ohms	100,000 ohms 500,000 ohms 1 meg.	50,000 ohms 100,000 ohms 500,000 ohms 1 meg. ohm
4/6 ea. 42/ doz.	2/6 ea. 24/ doz.	3/6 ea. 33/ doz.	1/9 ea. 16/ doz.

500,000 ohm pots can be supplied tapped at 40,000 if required, post extra.

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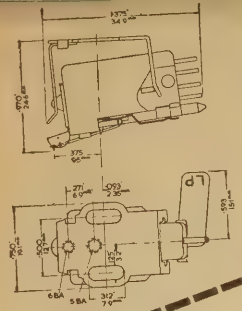
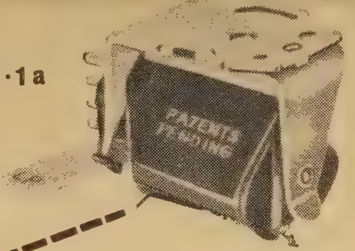
640 KING STREET, ST. PETERS, N.S.W. PHONE 51-8087

Crystal stereophonic cartridge

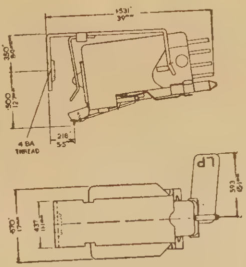

·375"
34·9
·970"
24·6
·375"
9·5
LP
·593"
15·1
6BA
5BA
·312"
7·9

73·1a

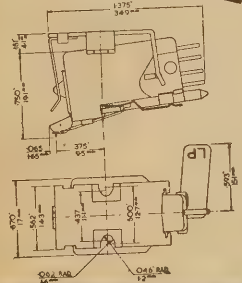

PATENTS
PENDING

73·1b

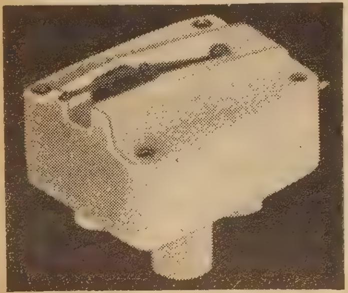
PATENTS
PENDING


1·531"
39
4 BA THREAD
LP

73·1c

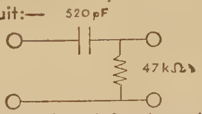

1·375"
34·9
·750"
19·1
·375"
9·5
LP
·593"
15·1
·870"
17
·562"
14·3
·437
11·1
·500"
12·7

PATENTS
PENDING

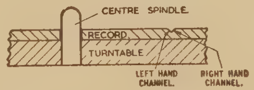


The "ACOStereo" 73-1 is a universal cartridge designed to play stereophonic and monophonic discs, including 78 r.p.m. coarse groove records. Three brackets, are available. The "a" bracket fits the majority of arms, the "b" bracket fits Garrard RC. 110 and RC. 120 changers, and the "c" bracket is intended for American arms of the VM type.

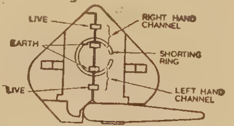
The output from the "ACOStereo" 73 is flat when fed into a 2 Megohm impedance. If record compensation is available in the amplifier, it is advised that the output is converted to constant velocity characteristics by feeding through this circuit:—



The left-hand channel is defined as the channel reproduced by the left-hand speaker when viewed by the audience, and is recorded on the left-hand groove wall when the record is viewed as:—


CENTRE SPINDLE
RECORD
TURNTABLE
LEFT HAND CHANNEL
RIGHT HAND CHANNEL

The "ACOStereo" cartidge connections as seen from the rear:—

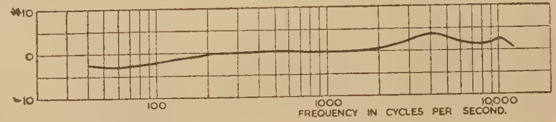

LIVE
RIGHT HAND CHANNEL
EARTH
SHORTING RING
LIVE
LEFT HAND CHANNEL

The shorting ring should be removed for use with amplifiers requiring separate leads.

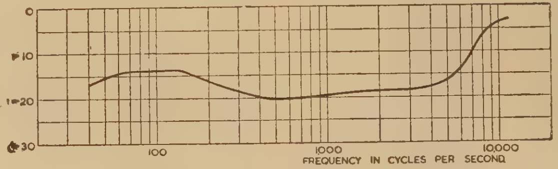
PERFORMANCE OUTPUT — 160 m.v. at 1 cm/sec.
Average — 300 m.v.

FREQUENCY RESPONSE—
40—12,000 c/s.
SEPARATION between channel at
1 K/cs better than 20dB.
Radii of Stylus tips—0.0005" (13.5 microns).
0.0025" (62 microns).
Recommended load: 2 Megohm.
(Compliance equals 3.5 ucm/dyne).
(Stiffness equals 0.0286 x 10 dynes/MM).
Recommended downward pressure: 3-4 Grammes.

The Stereo recording characteristics is within ½dB of the RIAA/BS 1928/1955 characteristics, and cross talk is better than — 20db at 1 K/cs.



Frequency response on PS.131.



Separation between Channels on PS.131.

The response of both channels will be within 3dB.

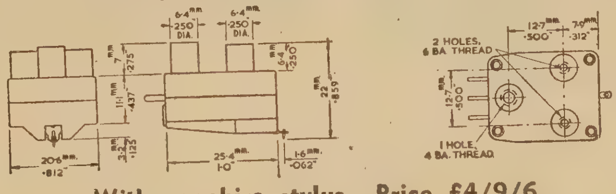
All 73 series cartridges are available with two sapphire, sapphire and diamond, or two diamond styli.

Prices: 73 series — Cartridge incl. 2 sapphire styli, £5/15/- with sapphire and diamond styli £11/18/6 with 2 diamond styli £15/19/6.

Available ex stock.

"How Stereo Works" gladly posted on request.

71-3 For stereophonic and L. P. discs (non turnover type)


6·4mm
·250
DIA.
6·4mm
·250
DIA.
7mm
·275
6·4mm
·250
11·1mm
·437
22mm
·859
3·2mm
·125
20·6mm
·812
25·4mm
1·0
1·6mm
·062
2 HOLES,
6 BA THREAD
12·7mm
·500
7·9mm
·312
12·7mm
·500
1 HOLE,
4 BA. THREAD

With sapphire stylus—Price £4/9/6
With Diamond stylus—Price £10/17/6

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AMPLION (A/SIA) PTY. LTD.

101 Pyrmont Bridge Road, Camperdown,
SYDNEY, N.S.W.

ANSWERS TO CORRESPONDENTS

(Ipswich, Q.) has built the One Tran- Set but is troubled by a local transmitter he cannot reject. He wants to know r there is a wave trap circuit which might

 wave trap might help a little, J.W., but an automatic answer to the problem. It fact, fundamental to all such small sets the local transmitter is strong enough. How- orrect use of regeneration can increase the ity very considerably and we suspect that unction has not been behaving or been d correctly, and should be carefully checked. ogether with a smaller aerial, can make a reat difference. A wave trap was described June, 1954, issue.

S. (Villawood) sends in some ideas for e use in the magazine.

hanks for your letter but we doubt whether l be able to make much use of it. Pencil s need to be redrawn for block making n this case, would involve more time and than we could justify. Your speaker idea certainly work but only at the expense of cond harmonic distortion. That is, in fact, ason why speakers are not made that way. lea of ganging the potentiometers has a fundamental weakness in that the one oper- n the reverse direction would have a com- different law from the one operating the way round. The output would therefore nain balanced.

(Hawthorn, Vic.) asks some questions whistles in an old receiver which are also in a nearby TV receiver and also about a ic recorder.

t would appear that the radio receiver is ing and the amplitude of the oscillation e very high if its harmonics are audible elevision receiver. If the receiver is of enerative type, it may simply be a matter rectly adjusting the regeneration control. receiver should be a superhet then it may t some of the shielding components have drift or that a stage is oscillating due to y component. In the magnetic recording copper could be substituted for brass but y silicon steel laminations would not work l as the mu-metal.

n a suitable switching system, the one ould be used for all purposes in this par- recorder.

G. (Coburg, Vic.) writes to congratulate us publication of the 1959 Karset design. At ne time he suggests a number of changes layout.

Ve are very grateful for your interest and oted the changes you suggest. However, f them would be practical in most cases they would have resulted in a receiver arger physically. Your suggested methods unting the transistor would have resulted fficient cooling. Rest assured that we have red these matters very carefully. In fact, ibt whether we have ever thought up and d as many provisional layouts for any one we did for this one.

P. (Broadmeadow, N.S.W.) complains of g in his receiver. It uses a back bias for the mixer and IF circuits and by ng the value of the bias resistor he can the whistle but only at the expense of very nsitivity.

he trouble would appear to be some basic ity in the mixer or IF amplifier, probably ter. We suggest that you make sure that d and plate leads of the stages are well ed, that properly earthed shields are used valves and IF transformers and that the lead of the set is kept clear of all signal wiring. If other measures fail, a second bypass capacitor from the HT line to may help. Try different connection points capacitor.

(Haberfield, N.S.W.) asks whether we publish information on radio control of ships and planes.

his is one of the matters we have had l for a long time, but have not been able, r, to do much about it. A lot of work is d in building and testing control gear ypical models and we just haven't had time to tackle it.

(Cowra, N.S.W.) asks several questions, about transistors.

here are a number of opinions about the e life of transistors, run well below maxi- atings, but it is certain that it is likely much greater than that for valves. If extreme ratings, transistor life can be lly reduced. Most transistors will operate degrees F without prejudice to life, given stabilising circuits and therefore are suit- r all climates likely to be encountered country. There are a number of small nd pamphlets on transistors published and e in Australia. We suggest that you o one of the valve companies. Valve S5 is not normally used to operate a aker. A better choice would be the ●V4 3S4.

(Goulburn, N.S.W.) is using transistors l252 and TS2 in a two-transistor receiver. He is only two miles from the local transmitter and finds that he can only pick up 2CY Canberra when the local transmitter is on and then with some interference.

A. The set certainly doesn't lack selectivity when used in a more normal location, but it would appear that a more elaborate receiver is required for optimum results. However, it would be worth trying the aerial coupled at the 1 turn tapping and, further, connecting a small trimmer capacitor in series with the aerial if the former does not reduce the coupling sufficiently. We have found that the forward bias resistor can profitably be reduced from 2.2 to 1.0 meg for the 2N252 and also that more reaction turns are frequently required for best results. At the cost of another ferrite ring and capacitor (either a single section or trimmer) a parallel tuned circuit could be placed in series with the aerial lead and tuned to the local station. It could be adjusted by tuning to the Canberra station and then tuning the trap for minimum volume on the local. If the local is so strong, you should still be able to receive it when the trap is in place.

R.T.K. (Mungungo, Q.) writes to the Serviceman to report another case of paper capacitors generating voltage within themselves.

A. Many thanks for your report, R.T.K., and we will pass your letter on to the Serviceman. We feel sure he will be interested to hear of this phenomenon again. From what we remember of the incident, your symptoms are very similar to those noted on the previous occasion.

J.F. (Watson's Bay, N.S.W.) writes to the Serviceman to tell of two interesting and unusual faults, one in an amplifier control unit and one in a commercial TV set.

A. Many thanks for the report, J.F., and we will pass this on to the Serviceman. The amplifier story in particular sounds very interesting and the sort of problem which can cause a lot of headaches unless one is lucky enough to track it down quickly.

J.B. (Sandingham, Vic.) has built the 35 watt public address amplifier described in the April, 1958 issue and wonders if it would be possible to operate it from the 240 volt battery/AC inverter which was described in the January, 1957 issue.

A. No J.B., the maximum power load which the inverter is designed to take is 60 watts and the power consumption of the amplifier is greater than this figure. We have actually described an amplifier designed to operate from batteries or the AC supply. It was called the "6-240" amplifier and appeared in the March, 1949 issue. It would be adaptable to 12 volt battery operation. Apart from the power supply, the amplifier is generally similar to the amplifier you have and if you would like to see the circuit, we would be happy to forward a copy to you under the usual query service conditions.

J.D.K. (Elliot, S.A.) sends the circuit of a crystal set which sufferes from lack of selectivity and wants to know if anything can be done to improve matters.

A. Lack of selectivity is one of the fundamental problems with any crystal set, and there is a definite limit to what one can expect. However, the circuit you submit appears to be a very elementary one and some improvement may be possible. It is usual to provide separate tappings for both aerial and detector, so that both may be adjusted for optimum performance. A better approach appears to be the use of two tuned circuits, as in our Twin Tune Crystal Set (April, 1951), and De-Luxe Crystal Set (August, 1954). We cannot offer much help in the matter of the transistor amplifier, since we do not know the conditions under which it is operating at present. A transistor amplifier for crystal sets was described in March, 1956.

B.R. (Kaingaroa, N.Z.) would like to see us describe some tape recording equipment with the emphasis on simplicity and low cost.

A. We have described a lot of tape equipment in the past and, while we realise that it is time we produced some new circuits, the older ones still may be of some use to you. Two Tape Adaptors (for use with existing amplifiers) were described in January and July, 1953, a Tape Deck in December, 1952, and an article on constructing tape heads in November, 1953. With the exception of the latter, circuit reprints are available through our postal service, and you may be able to refer to these issues at your nearest public library.

A.J.F. (Reservoir, Vic.) asks if we can supply a back issue containing the circuit of a signal tracer.

A. A Junior Signal Tracer was described in the October, 1952 issue and two versions of a Senior Signal Tracer in the May and June, 1954 issues of the magazine. The last has provision for signal tracing on the shortwave bands. Unfortunately, none of the complete issues are available but we would be glad to supply copies of the circuits and other relevant data through the 2/ query service. Full information on the query service appears in these pages.

B.J.K. (Lower Ferntree Gully, Vic.) is interested in a 14in TV receiver recently advertised by one of our coil manufacturers. He suggests that this is an ideal receiver for younger readers on a limited budget, and that we describe such a circuit in the near future.

A. Many thanks for the suggestion, B.J.K., and you may be sure we have the idea of smaller sets in mind. However, we feel that you may be disappointed at the saving, since it would not amount to much more htan the lower price of the picture tube. Almost every other part of the receiver would be the same—in terms of costs—because exactly the same functions have to be performed and the same number of valves and other components required to perform them. Have you considered the 5in set described in August, 1958?

The Radio, Television and Hobbies Query Service

All queries concerning our designs, to which a POSTAL REPLY is required must be accompanied by a postal note or stamps to the value of TWO SHILLINGS.

For the same fee, we will give advice by mail on radio matters, provided the information can be drawn from general knowledge. UNDER NO CIRCUMSTANCES, however, can we undertake to answer problems involving special research, modification to commercial equipment or the preparation of special circuits.

Whatever the subject matter, we must work on the principle that a letter is too involved if the reply takes more than 10 minutes of our time.

Queries not accompanied by the necessary fee will be answered FREE in the columns of the magazine and presented in such a way as to be of interest to other readers.

To those requiring only circuit reprints, &c., we will supply for TWO SHILLINGS diagrams and parts lists from our files covering up to three constructional projects. Scale blueprints showing the position of all holes and cutouts in standard chassis can be supplied for 5/-. These are available for nearly all our designs but please note they do NOT show wiring details.

Address your letters to The Technical Editor, RADIO, TELEVISION and HOBBIES, Box 2728C, GPO, Sydney.

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RMA No.	Tolerance 5%	10%	20%	0 to 1.0 ohm	1 to 9.1 ohm	10 to 91 ohm	100 to 910 ohm	1000 to 9100 ohm	10000 to 91000 ohm	0.1 meg to 0.91 meg	1.0 meg to 9.1 meg	10 meg to 91 meg
10	▨	▨	▨	-	1.0	10	100	1000	10000	0.1	1.0	10
11	▨			-	1.1	11	110	1100	11000	0.11	1.1	11
12	▨	▨		-	1.2	12	120	1200	12000	0.12	1.2	12
13	▨			-	1.3	13	130	1300	13000	0.13	1.3	13
15	▨	▨	▨	-	1.5	15	150	1500	15000	0.15	1.5	15
16	▨			-	1.6	16	160	1600	16000	0.16	1.6	16
18	▨	▨		-	1.8	18	180	1800	18000	0.18	1.8	18
20	▨			-	2.0	20	200	2000	20000	0.20	2.0	20
22	▨	▨	▨	-	2.2	22	220	2200	22000	0.22	2.2	22
24	▨			0.24	2.4	24	240	2400	24000	0.24	2.4	24
27	▨	▨		0.27	2.7	27	270	2700	27000	0.27	2.7	27
30	▨			0.30	3.0	30	300	3000	30000	0.30	3.0	30
33	▨	▨	▨	0.33	3.3	33	330	3300	33000	0.33	3.3	33
36	▨			0.36	3.6	36	360	3600	36000	0.36	3.6	36
39	▨	▨		0.39	3.9	39	390	3900	39000	0.39	3.9	39
43	▨			0.43	4.3	43	430	4300	43000	0.43	4.3	43
47	▨	▨	▨	0.47	4.7	47	470	4700	47000	0.47	4.7	47
51	▨			0.51	5.1	51	510	5100	51000	0.51	5.1	51
56	▨	▨		0.56	5.6	56	560	5600	56000	0.56	5.6	56
62	▨			0.62	6.2	62	620	6200	62000	0.62	6.2	62
68	▨	▨	▨	0.68	6.8	68	680	6800	68000	0.68	6.8	68
75	▨			0.75	7.5	75	750	7500	75000	0.75	7.5	75
82	▨	▨		0.82	8.2	82	820	8200	82000	0.82	8.2	82
91	▨			0.91	9.1	91	910	9100	91000	0.91	9.1	91

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IRC Type	Rating at 40° C. Ambient	Length	Diameter	Lead Length	Lead Diameter	Rated Voltage	Minimum Resistance	Maximum Resistance
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(Indooroopilly, Qld.) has built the "Transeven" using commercial wiring boards. are excellent except under certain cires when there is instability in the RF It can be removed by slightly detuning the IF transformers.

e overall gain of the IF section is very a combination of high gain transistors, n IF transformers, etc., can sometimes oscillations. With one particular wiring ve have found that complete stability restored by reversing the connections to ctor and emitter of the second IF tran-N309) on the wiring board. In more e transistor is taken out, turned around ldered. The wire from the tap on the F transformer to the collector of the s then transferred to the segment of wiring previously connecting with the m resistor and 0.047 uF capacitor. (This s to the collector.) A couple of extra e drilled in the new emitter segment 1,000 ohm resistor and 0.047 uF soldered s the electrical circuit remains the same capacity between the 2N309 collector adjacent early part of the circuit is re-

(Bordertown, S.A.) writes to express his ion of the magazine and to detail some rojects he has undertaken with success. makes a few suggestions and comments Serviceman articles.

ny thanks for your comments. R.D.C.. are glad to learn that you have had cess with your projects. Thanks also Serviceman comments, which we will pass im. We will keep in mind your sug-regarding 50 and 144 Mc and single designs. In the matter of noise limiters, not be hard to add these to most if they are so useful, and we could some sample circuits through our postal this would help you. We hope you cess with the transistor projects, and be glad to hear how this works out.

(Pinnaroo, S.A.) has a two-volt vibrator he would like converted for 240-volt and would like to know what is in-

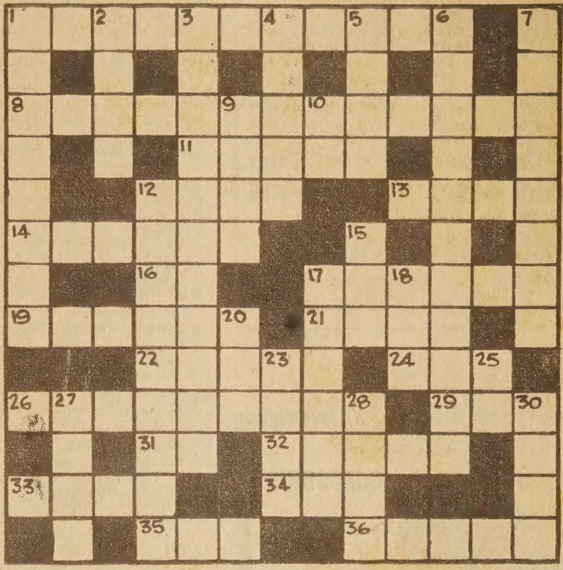
re is no easy way to make such a conand it would almost certainly involve t of valves, the removal of the vibrator nd the fitting of a new power supply. le, such an undertaking is uneconomic lot of the work can be done by the A compromise might be a power supply HT and to retain the accumulator for ents alone. If a small charger can be operate whenever the set is switched uld be kept working with a minimum

ay be able to supply a suitable power om our files if we have details of the ed and the HT requirements of the set.

(Brighton, Vic.) is interested in the sed ignition system described in the June d wants to know what type of tranuld be used, etc.

ry, T.P.W., but this was a reprint article overseas source, and we have no inother than that published. However, appear from the article that there is a more to it than simply fitting a ranan existing sysem, the whole system be re-designed in order to take advantе transistor's special characteristics.

THE R., TV & H. CROSSWORD No. 64



ACROSS

1. Early method of recording.
8. A combined-duty amplifier circuit, for RF and AF.
11. Runs (as horse).
12. German industrial district.
13. Egg-shaped.
14. A number.
16. French definite article.
17. Insulated conductors.
19. Heavenly bodies.
21. Musical instrument.
22. Often eaten with tea.
24. Emmet.
26. South Australian town.
29. A metal.
31. That is (abbr.)
32. Winged insects.
33. An inhabitant of Eastern and Central Europe.
34. To cause to sit.
35. A Greek letter.
36. Resistance to divert part of a current.

DOWN

1. Multiple of the fundamental frequency.
2. Space under the roof.
3. Cellulose tape.
4. Stage scenery.
5. Ventilates.
6. Equals in value.
7. Reactive.
9. Type of ray.
10. Pronoun.
12. Capable of discriminating between differing frequencies.
15. Pat gently.
17. A trigonometrical ratio.
18. A large species of snake.
20. Move over snow on wooden runners.
23. Work units.
25. Symbol for titanium.
27. Make eyes at.
28. Consumes.
30. Tidy.

Solution and further crossword next month

SERVICEMAN
O TELLS

Continued from Page 45)

its about set No. 1, he finished ing both back to the dealer and see something else.

't know whether his criticisms of sharpened their wits, but the he received (another well-known was a good one, even though I touch up the tuner again, centre ure, and adjust the height con-owever, these were minor points, set passed all other tests with ks. So this is one person who nely happy with a top notch set, ate to think what he might have

er case I struck recently is of the other aspect of this probhere was nothing seriously wrong set on this occasion — in fact a very good one — but the rere woeful, simply because no one thered to explain the purpose various controls.

With virtually no idea what each one was for, the family were too scared to touch anything but the channel selector and volume control. Thus the picture was accepted "as was" in regard to brightness, contrast, fine tuning, etc., regardless of the channel, program material, room lighting conditions, and so on. Needless to say, some of the results were postively ghastly.

After some tuition, and when they realised that they didn't have to tolerate pictures which ranged from washed out to soot-and-whitewash, from dingy to glaring, riddled with sound bars or horribly degraded, their attitude to the set — and to TV entertainment as a whole — changed completely. They eventually bought the set, but it is significant that they thank me, not the salesman, for putting them on the right track.

I admit that teaching people to operate a TV set can be a difficult and thankless task since, to most of them, it is something completely foreign. Often they cannot even appreciate the meaning of terms like "contrast" or "brightness" let alone distinguish between the two, and they have to acquire a completely new vocabulary and set of standards. Nevertheless, this is one of the jobs the salesman is paid to do — and paid pretty well as a rule.

Last month's solution

B	U	F	F	E	R	■	■	N	A	N	C	Y
A	■	I	■	L	E	A	K	A	G	E	■	E
R	E	L	A	Y	S	T	A	T	I	O	N	S
K	■	T	■	■	O	T	T	O	S	■	■	T
H	■	E	■	K	N	E	E	■	T	O	N	E
A	I	R	■	■	A	N	S	W	E	R	■	R
U	■	C	H	A	N	T	■	A	D	D	E	D
S	O	H	O	■	C	I	T	Y	■	I	■	A
E	R	O	S	■	E	V	A	■	■	N	A	Y
N	I	K	E	■	■	E	N	D	■	A	■	■
■	S	E	D	G	E	■	D	■	S	T	A	R
■	O	■	■	A	■	H	E	A	T	E	R	■
U	N	I	T	S	■	■	M	■	Y	■	M	■

These are not the only cases I have struck by any means, merely typical ones. What's more, they are rather more frequent than would be likely if they were simply isolated cases. So perhaps an appeal for a little more attention to these details may not be out of place.

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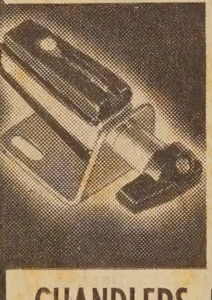

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